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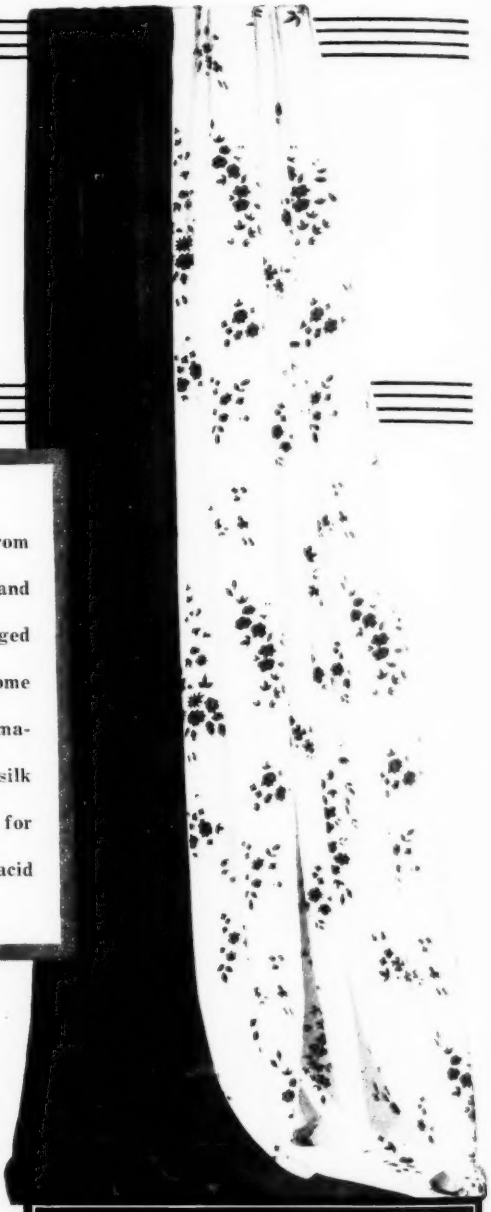

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Some Practical Aspects of Warp Mercerizing

By ARTHUR W. SKINKLE

In writing this article, the author presents the results of thirty years' of experience in the mercerizing business during a period in which many readjustments and minor discoveries were being made in this branch of the textile industry, and in plants which were perhaps more willing than most to experiment and try new variations. He has endeavored to bring together sufficient indication as to what he considers good practice as to give some idea of the process of warp mercerizing without filling a book. Necessarily many points must be omitted or glossed over in a single statement which could be discussed at considerable length, also many points might be hotly debated by other mercerizers, but until the fundamental chemistry and physics of the process is fully understood this is inevitable. For the sake of having some sort of outline to the discussion, let us start with the yarn which is to be mercerized and continue along the machine with it.

IN GETTING together a set of warps, the first question arising is that of the type of creel or support for the warp packages. Some mercerizers prefer low horses, which makes the labor of lifting in the warps somewhat less; others prefer to have creels constructed which will hold the warps in tiers of three or four. Horses are satisfactory where the chains being run consist of only one or two warps each, but if the total number of warps being run is always a large number it is better to use the creel and save floor space. Whichever type of support is used, it should be seen to that each warp end runs straight to the winder, eliminating the turning of corners or the cutting of sharp angles as completely as possible; if this is not done the unequal tensions on the warps will cause them to mercerize unevenly, to throw excess strain on one or two warps with consequent danger of breakage, and to split and quill after mercerizing with more difficulty. It will also be noted that warps with the greatest friction on them will be stretched enough to make them run out of the machine appreciably later than the rest of the set and to make the count slightly lighter than the rest of the warps.

The ends of the warps should run parallel with each other but separated by means of pegs or pot-eyes so that warps will not roll or twist together nor the threads composing two warps intertwine or mat together causing difficult splitting and quilling. This separation of the warps should be carried right up to the water-banding machine.

In considering the number of warps to be united in a chain in the water-bander, there is only one hard and fast rule to hold to: The chains of yarn, after banding, should be of uniform bulk or thickness. The reason for this is so that all the chains will be given a uniform squeeze or nip in the many heavy rolls of the machine through which the chains must pass; for instance, if a chain made up of three warps of 40's two-ply is run between two chains made up of three warps of 30's two-ply, the thinner chain will not be gripped by the squeeze rolls as tightly as the two thicker chains and is liable to be pulled through the rolls by the shrinkage of the yarn, thus causing chaffing. The determination of the correct thickness, on the other hand, is a matter of personal preference and compromise. If the chain is made very thin (in some cases only one warp to a chain) the boiling-out is more thorough and quicker, the penetration of the caustic quicker and more even, and the souring quicker and more easily done with less acid; the whole machine may therefore be speeded up. The disadvantages of this method are: less tension must be used on the warps and hence less luster will be obtained, danger of breakage unless the tension is cut down, a loss in capacity of the machine even after speeding up. On the other hand, if the chain is made too thick a larger capacity is obtained and a greater tension may be used, but the boiling-out is less thorough, the penetration of the caustic is less even, the penetration of the acid is poorer, possibly insufficient, and the drying of the chain is more difficult.

Some of these faults may, of course, be eliminated by slowing down the machine, but this step does away with the chief advantage of the bulky chain—large capacity.

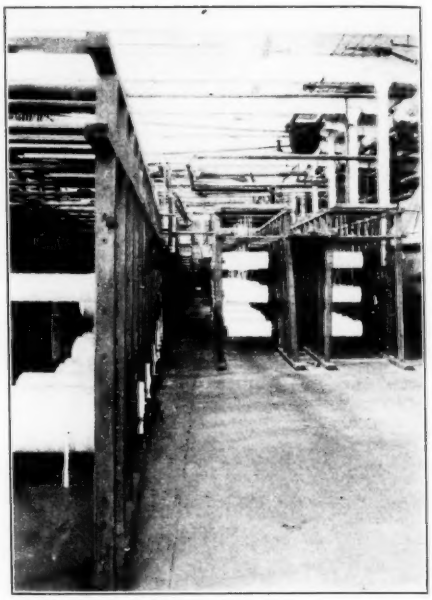
In order to reconcile the demands of penetration with large capacity it is necessary to make a compromise on the bulk of the chain; in the author's opinion the correct bulk and speed is 540 pounds to a 6000 yard chain or 90 pounds per 1000 yards of length when operating at a speed of 750 yards per hour. If the machine is a twelve chain machine, this means a production of 6480 pounds per eight-hour day when running 6000 yard warps. According to this rule, if there are 378 ends to a warp the following number of warps should be combined in a chain: 2 warps of 20's/2, 3 warps of 30's/2, 4 warps of 40's/2, 6 warps of 30's/1, 12 warps of 60's/1, etc. This same rule is approximately true for warps of from 350 to 400 ends per warp.

It is desirab'e that yarns of different numbers of plys should not be mixed in the same chain; for instance, two ply yarn should not be mixed with three ply and certainly single yarns should not be mixed with ply yarns unless absolutely unavoidable. Yarns of opposite twist should never be combined in a chain because of the tendency to roll or twist together in the boiling out or in the caustic when shrinkage occurs. Chains of warps of mixed twist cause slower splitting and more end breakage than uniform chains.

It is better also to run gassed and ungassed yarns in separate chains but not necessarily in separate sets. It is possible for a warp of yarn, gassed or singed before mercerizing, to deposit upon an ungassed warp, especially of peeler cotton, some of the dust or residue formed in the gassing process, and this dust when not properly washed off causes stains or shadings to appear which are difficult to remove after the complete processing and drying of the chain.

We now come to the winder or water-banding machine whose mission it is to wind a thread around each chain of yarn to prevent it from spreading over a large area and matting with other chains. These machines have been of inestimable aid to the mercerizer who formerly smashed up warps, chains, and even whole sets of yarn

Side view of creels



Rear view of creels

due to ends lapping around rolls or running off the ends of rolls when the yarn without a water-band ran as a whole sheet across the whole width of the machine. The distance between the windings may be altered by varying the speed of the winder; the greater the distance between the windings, the more the chain will spread out on the rolls—this is undesirable from the danger of matting but desirable for penetration, a good rule is to set the winding spaces so that they are less than the circumference of the immersion rolls. For instance, if the immersion rolls are four inches in diameter their circumference is a little more than twelve inches. If the spacing of the windings is greater than this distance it is possible for a broken end to lap about an immersion roll, break other ends, and eventually cause a shut-down; it would be better then, in this case, to make the winding distance ten or even eight inches.

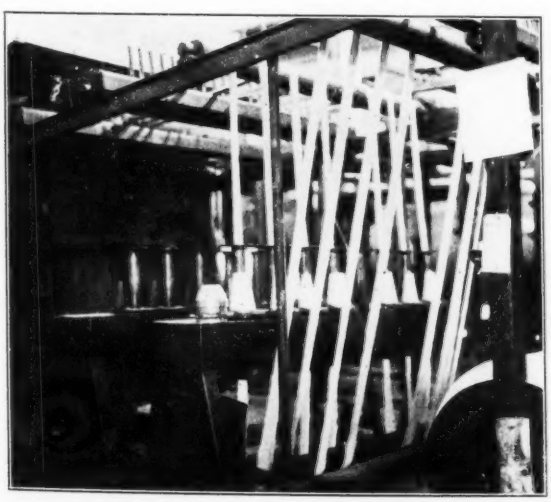
The winder should also be so constructed that the tube in the spindles is of as large a diameter as possible. If too narrow a tube is used the friction on the thick chains will break ends and will also wind the warn up on itself, forming a tightly twisted mass which will allow poor penetration and will cause difficulties in unwinding and splitting.

The water-banding yarn itself should be a good strong thread and not a weak, poorly constructed one which will break at every opportunity, roll up into a mass which will finally come up between two heavy nip rolls, stick, and break many ends of yarn in the chain.

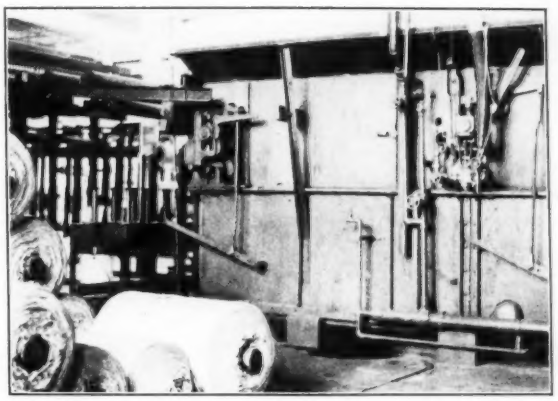
The yarn is now ready for entering the boiling boxes: it is here that one of the greatest differences of opinion between mercerizers arises—as to what (if anything) these boxes should contain as an assist in wetting out or boiling out the yarn. Some years ago, a solution of one to five per cent of caustic soda and the same amount of

soda-ash was used here and the contents of the boxes were kept at boiling temperature or as near it as hand control would allow. The boxes would sometimes boil over and the machine operator would then shut off the steam completely or at least partially; he would then perhaps become busy at something else and forget to turn on his steam until some time had elapsed and the temperature had dropped considerably. It is the author's experience that at this point to a very great extent there occurs the reason for the curse of all mercerizers, namely, uneven dyeing as the result of uneven mercerizing since it is at this stage that the pectin, waxes, and other impurities in the cotton are removed if they are to be removed at all. It follows from this that conditions in the boiling boxes should be absolutely constant so that every yard of cotton put through may receive the same treatment as any other yard so that upon entering the caustic bath the chances of obtaining uniform treatment are as great as it is possible to make them.

The use of fairly strong solutions of caustic soda or soda-ash has been largely discontinued of late years, since it has been shown that the cotton waxes which must be removed to allow the yarn to be wet out cannot be saponified but must be removed by emulsification. Nevertheless there are mercerizers who use nothing but boiling water in their boiling boxes and claim good results. There are, upon the market, innumerable compounds to be used as assists in boiling out or wetting out, some of them with most extravagant claims and some which are really good. Soaps were in rather general use for some time but were eventually abandoned, soluble oils are much used, and cocoanut oil emulsions have been successful in practice. The author has used a mixture of one per cent pine oil with one per cent soluble oil with exceedingly good results. Whatever compound is used in the boiling box, there should be a continual flow of clean water to the boiling box or in the course of a day's run it will become very dirty.



Water-banding machine



Water-banding machine and boiling boxes

There are some mercerizers who boil out their yarn in a separate machine and allow it to stand overnight before processing it; there are others who kier-boil all of their yarn before mercerizing with the object of obtaining even mercerizing and consequently even dyeing.

The question of immersion rolls in these boxes is a matter of choice between the regular small brass rolls, copper or brass cylinders about twelve inches in diameter, or reels made of brass or copper pipe and of about twelve inches overall diameter. The nip rolls should, in the interest of economy, be of rather hard rubber since the softer grades of rubber at the temperatures to which they are exposed soon become creased by the chains of yarn passing between them.

Due to the small amount of water being fed into the boiling boxes, the overflow is very small and consequently a scum forms which is not removed by the overflow. This scum should be skimmed off at frequent intervals because large spots of the material might get on the yarn, be carried into the nip rolls, and be pressed into the yarn firmly enough to be carried all through the following operations.

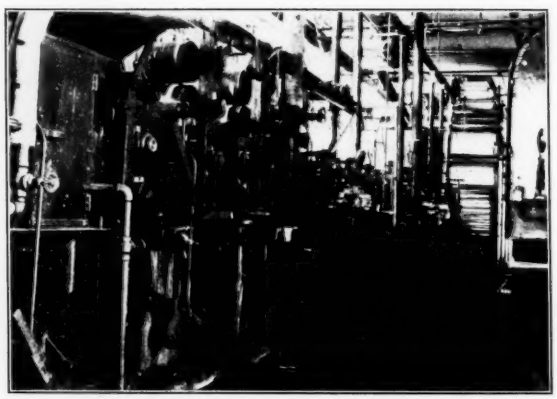
The yarn must now be cooled off before entering the mercerizing bath proper. Plenty of cold water should be used so as to both cool the yarn and also wash out any foreign substance carried over from the boiling boxes. Upon leaving the cooling box, the best possible squeeze is given to remove as much water as possible so that the lye bath will not be unduly weakened.

The next step is the mercerization proper or impregnation with caustic—sodium hydroxide is almost universally used. The chemistry of this process is not yet fully understood and so the discussion of this step will be confined to the mechanical and industrial aspects of the process.

It has been claimed, and proven by tests, that thirty-six seconds immersion in caustic soda of 56° Twaddle (1.280 specific gravity) at 60° Fahrenheit is sufficient time for well wet-out cotton to become mercerized, but in general practice from one and one-half to two minutes is usually allowed. The author believes that the full two

minutes should be used in order that complete penetration to the interior of the chain may be assured.

The temperature of the mercerizing bath has ever been a matter of dissension. Refrigerating systems have been installed, but with very little success as far as holding the temperature continually down to a low temperature. It may easily be seen that it would require an enormous refrigerating system to maintain an even temperature of 60° F. continuously over the run of a modern mercerizing range producing 6,000 pounds or more of yarn in a space of less than eight hours, and requiring for that period of time at least ten thousand gallons of lye solution for vat, feeding on, and strengthening purposes; the wet yarn alone entering the lye bath raises the temperature very rapidly. The chief value of a refrigerating unit is to maintain a more even (although rather high) temperature than is possible where no mechanical cooling is employed. A set of yarn running in a machine that is not mechanically cooled may start with the temperature of the lye bath at 60° F. and when this same set finishes the temperature, especially during warm months, may be 120° F.—a variation of 60°. With some sort of refrigeration, this variation might be kept down to about 30° which would be a decided asset in obtaining even mercerizing since the temperature of the lye bath controls to a large extent the shade of the finished yarn; the higher the temperature of the caustic, the darker the shade of the yarn.



Cooling box and caustic boxes

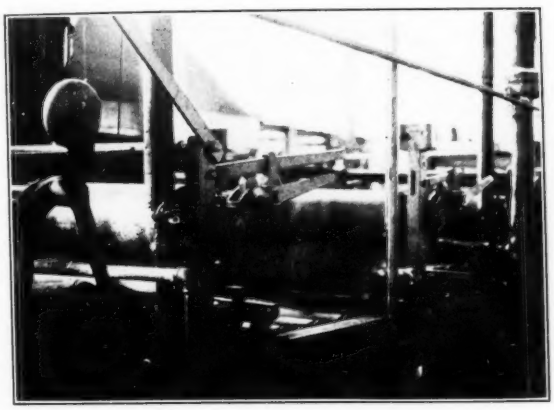
A refrigerator capable of eliminating this difference in temperature entirely would cost a very large sum both in initial cost and in upkeep; but a smaller system may well be used to advantage in decreasing the variation.

The tension of the yarns in the lye bath and the caustic washes is the great factor in obtaining luster and a large one in the determination of the breaking strength of the mercerized yarns. By using the maximum tension or stretch that the yarn will stand without breaking, the highest luster will be obtained. Of course a yarn made of Sea Island or Egyptian cotton will stand more tension than one of the same count made of Peeler cotton. It also is evident that fine counts of yarn will not stand the strain that the coarser numbers would. The modern mercerizing ranges are nearly all equipped with change gear combinations which allow different sections of the machine to run at different speeds; this makes it possible to put slack into the caustic bath in the running of very fine yarns, causing a loss in length of the warp, or to hold the yarn to its original length or even stretch it in the case of coarser counts. If the yarn were not held tightly between nip rolls, the natural shrinkage would be up to 30% of the length of the yarn; it is evident therefore that all the rolls and bearings in the caustic compartments are under a tremendous strain and should be watched and well cared for. It has been shown that yarns held to their original length during mercerization have a higher breaking strength than yarns of the same count and construction that have been allowed some shrinkage; this strength is not, however, as great as that of yarn mercerized without any tension, this last gives no luster and is seldom used.

In regard to the strength of caustic to use, there is again a wide diversity of opinion. Some practical mercerizers claim that a density of 70° Twaddle (corresponding to 24% of actual alkali) should be used, many others use densities around 48° (16½%). The author has run hundreds of practical tests at concentrations between these two points and has failed to find any difference in the results that would be of commercial value, although with the stronger solutions chemical costs were larger because of the inevitable leakages and losses. It was found that whatever strength was decided upon must be kept as constant as possible in order to insure uniformity of product. The author believes that a strength of 56° to 58° is a satisfactory mean value and allows some leeway for the impurities which accumulate in the caustic and give a false density reading. These impurities may be removed by means of a good caustic soda filter, or if the tank capacity of the plant is large by settling the caustic over a period of time. If recovery of caustic from the wash waters is being practiced, a partial evaporation to 36° strength, settling, and further evaporation will give remarkably clean caustic solution.

The caustic liquor should be fed continuously at one end of the impregnation vat and be overflowed from the other end, thus maintaining a constant circulation. Small amounts of a stronger solution should be added to the caustic feed tank from time to time to keep the liquor in the machine up to its proper strength. All tanks whose liquors come in contact with the yarn being processed should have their piping connections (except those to the sewer) raised above the bottom of the tank so that no sludge or dirt will reach the machine. The rolls in the caustic and caustic washes should be of iron, with the exception of the top nip rolls which may be of rubber of medium hardness. The best possible squeeze should be given the yarn upon leaving the caustic bath and entering the first caustic wash. The cages or frames which hold the immersion rolls in the caustic bath should be easily accessible as they often have to be removed or examined—an unpleasant job even under the best conditions.

Many compounds, most of them of a phenolic nature, have been advocated for use in the caustic bath for the purpose of giving quicker and better penetration. Some of these substances allow the yarn to enter the caustic in the dry state without any previous wetting-out or boiling-out. Most of these assists are expensive and require the use of relatively large amounts. A good steam distilled pine oil seems to be the best of these assists and has been used very successfully in the caustic bath—a strength of one-half of one per cent of the weight of the caustic bath is used. The results of runs with pine oil showed a softer yarn, slightly higher breaking strength, as good a luster, and less loss of weight than is the case in ordinary mercerizing. The pine oil mixes quite readily



Acid box

with the caustic upon a little agitation. The caustic bath must be watched as it becomes charged with coloring matter from the cotton, which has not been previously boiled out. There is very little dilution of the strong caustic since the yarn enters the caustic dry and this results in considerable saving in steam if evaporation and recovery of the caustic is being practiced; there is also a saving in cost due to the elimination of boiling-out compounds and water and steam for boiling out.

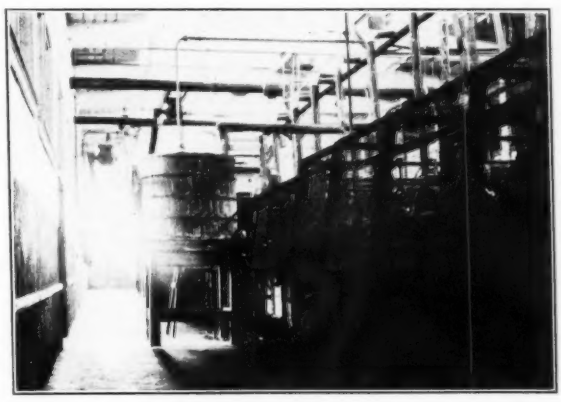
Upon leaving the caustic, the yarn passes through a series of washes the objects of which are to complete the mercerization process and to remove as much as possible of the caustic. The number of these washes varies with different machines but in general it may be said that the number should be as large as possible. If a recovery plant is run in conjunction with the mercerizing department, a back wash of water should be used; that is, cold water is sprayed on the yarn at, let us say, the third wash-box and flows back to where the yarn enters the first wash and overflows to run to the recovery plant, or to storage tanks. The idea where the caustic is being recovered is to obtain the greatest amount of washing with the smallest amount of water. The return wash liquors to the recovery plant should register at least 8° Twaddle as it does not pay to evaporate caustic liquors below this strength.

The washings in the third box are heated to about 110° to 120° F. but the yarn must be cooled by a cold wash after this before entering the acid or neutralizing bath. If there is no recovery of the caustic, a greater amount of water should be used in the washes in order to save acid. Also, in either case, the yarn should be well squeezed before entering the acid in order to eliminate as much caustic liquor as possible and save acid. Some mercerizers apply more or less stretch to the yarn during the washes with the idea of obtaining more luster, at any rate the tension used in the caustic should be maintained in order to obtain the full luster; it is questionable whether any additional tension would give greater luster.

At this point it may be well to add that, wherever water is used for washing or rinsing, it is more efficiently applied by spray pipes than by simply flowing it into the tank.

A fairly recent modification of the caustic wash is one in which the washing is done by means of steam instead of water. The condensed steam, of course, does the washing but since it is very hot, less liquid is needed and consequently the resulting overflow is much stronger in caustic than usual. Of course, before entering the acid the yarn must be cooled by a cold wash.

Now that the actual mercerization has been accomplished, the excess caustic must be removed or neutralized; as long as any caustic remains in the yarn there is danger of shrinkage and loss of luster. The neutralizing agent may be almost any acid of a proper strength—in most cases the acid is sulfuric acid or the commercial oil of vitriol. Hydrochloric acid and mixtures of hydrochloric and sulfuric acids have been used by some manufacturers with the idea of obtaining a softer yarn but the cost is greater than with sulfuric acid. The use of organic acids such as acetic and formic acids has been advocated and such acids are desirable from the point of view of softness and freedom from acid damage but the cost is considerably greater than that of sulfuric acid.

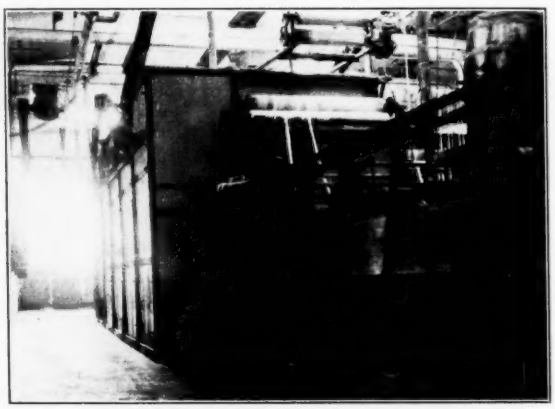


Acid feed tank

The temperature of the acid bath must be kept as low as possible—100° F. or lower is best. The strength of the acid must be governed by the amount of neutralizing that it must do; the less the strength of the acid may be kept and still neutralize all the caustic, the less danger there is of damage to the yarn. If the speed of the

machine is so great as not to allow time enough for the acid to completely penetrate to the center of the chains, then another acid box is necessary, this is much better than to try to neutralize with a very strong acid bath.

The acid bath is very apt to become discolored and dirty, therefore the acid should be constantly flowed into the box and allowed to overflow to the sewer. If this neutralizing liquor is not kept clean, shaded yarn will surely result. A good method is to feed into the bottom of the box through a perforated lead pipe and overflow from the top of the box. The author has found that with the acid at 4° to 5° Twaddle and the yarn requiring 50 seconds to pass through the box he can neutralize any of the hosiery yarns and with a strength of 7° to 8° any of the harder twisted thread yarns.



Entrance to air drier

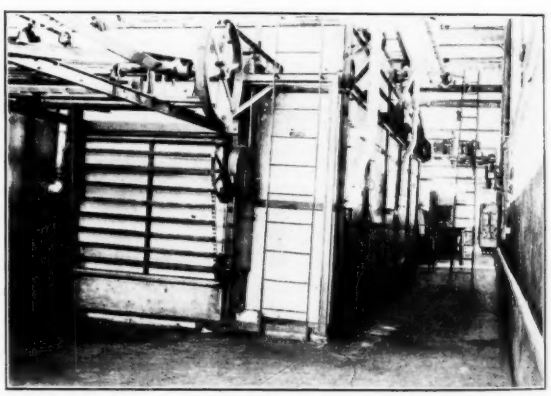
After souring, the yarn continues on through a series of acid washes, the first of which is, of course, cold to prevent any tendering of the yarn; beginning at the second wash some heat may be applied to facilitate the removal of the acid. These acid wash boxes vary in number with the different makes of machine but again a larger number is desirable. The washing should be very complete, spray pipes should be used and plenty of water used. The temperature in the warmest of these boxes should not exceed 120°F.

No matter how well or carefully the yarn has been washed, there will still be at least a trace of acid remaining and this should now be neutralized. This neutralization can be done by means of any weak alkali—the two most commonly used being sodium carbonate and ammonia. Ammonia is to be preferred for the sake of softness and because any small excess will be removed during the drying of the yarn, since ammonia is volatile. After the ammonia bath, the yarn is given another warm wash and is then dried or sometimes softened and then dried.

Often if the processor knew what a yarn was to be used for, there would be no advantage in softening—if the yarn were to be dyed before knitting, for example. The use of improper softeners is often to blame for what customers call "uneven mercerizing"; and while on this subject it might be well to add here that successful dyeing of mercerized yarn depends upon applying the dye slowly, if this were done more often there would be fewer complaints as to "uneven mercerizing" which shows up especially badly in the so-called "tiger stripes" on knitted goods. Sulfonated tallows, soluble oils, and softeners with a stearic acid base are all used successfully. If the yarn is to be dyed or bleached after the mercerizing process there is no need to soften, indeed it is not necessary for yarn that is to be bleached to have the caustic neutralized at all—all of the baths from the caustic bath to the end of the machine may be used as washes and the small amount of caustic remaining in the yarn will not be a detriment but an additional aid in the kier-boiling process.

For drying the chains, mercerizers use one of two methods—dry cans or air dryers. The old dry-cans were apt to give somewhat harsh results and the appearance of being calendered, while air driers leave the yarn soft and with a good bloom. Since the less heat is used to dry the product, the better the yarn feels and the better condition it is in, close control of the drying process is necessary and this can be best obtained by air driers. Conditioning chambers may be installed on air driers which permit the yarn to be finished with about any desired percentage of moisture.

One accessory that the author considers essential for good mercerizing is a complete set of temperature controllers. This is not only a money saver in preventing the use of steam but also gives even temperature from start to finish of a set and the possibility of duplicating conditions exactly from one set to another. The control of the strength of solutions is also desirable.



End of drier

In closing, the author would like to emphasize the fact that mercerizing only enhances the original properties of a yarn; carded cotton yarns will never look the same as combed yarns, yarns made of a poor grade of cotton will never equal yarns made of high grade cotton, nor will it be possible to have the finished breaking strength of two different yarns the same when one yarn has a lower initial strength than the other. The moral is obvious—the mercerizer is not always to blame for poor mercerizing.

Dyer's Accounts, VII

Capital and Revenue Expenditure—Principles of Costing—Method of Keeping Contract Accounts—The Dyer and His Current Account—Method of Recording Dishonored and Unpaid Cheques

By S. HOWARD WITHEY

THE amount of capital expenditure to be met by the dyer today is very considerable indeed, and it is essential that all such expenditure should be recorded in a proper manner in the books of account. Indeed, unless this is done, and unless a correct distinction has been drawn between capital expenditure and revenue expenditure, a good deal of additional clerical work will have to be undertaken at the end of the financial year if the final accounts are to be of any real value.

When new machinery or plant is bought, the bookkeeping records should show the full sum which is chargeable to capital account, this amount being subsequently debited to the particular asset account kept in the dyer's private or general ledger, which should show the date and page on which the transaction has been entered in the subsidiary book.

These capital items will, of course, be subjected to deductions at the close of each year so as to cover the depreciation resulting from constant use or caused by actual obsolescence, these deductions being transferred to the debit side of the depreciation account, kept in the dyer's nominal or expenses ledger, and the final balance of this account will appear on the debit side of the periodical trading or profit and loss account. Particulars of machinery or plant repairs should not be shown in the asset account, but should be posted direct from the book of original entry to the debit side of a general repairs account which will be closed at balancing time by transfer to profit and loss, but as regards replacements, it will be necessary to decide quite definitely whether or not the total value of the assets has actually been increased as a consequence of the expenditure. For example, the dyer may replace a machine or a tool by another possessing a much greater productive efficiency, and may decide to leave the asset account unaltered, in which case the cost of the replacement will be charged against the profits as so much recovered investment. But if the book value of the replaced machine or tool has been written off against the profits, the replacement cost should be treated as capital outlay and debited to its respective asset account.

The cost of buying business premises is, of course, a capital item, and should be posted from the dyer's purchases book, or from the credit side of the general cash

Capital Expenditure	Revenue Expenditure
Cost of acquiring freehold property, including land. Legal expenses in connection with the transfer.	Repairs to the property. Ground rent. Shrinkage in actual market value. The legal expenses (as soon as possible). Loss sustained on sale.
Cost of purchasing leasehold property, including land. Legal expenses in this connection.	Repairs. Adequate sum as provision against lapse of time. The legal expenses over a reasonable period.
Cost price of new machinery or plant. Carriage or cartage of this, up to the time of its arrival on the dyer's premises. The cost of repairing second-hand units which may be found essential to productive efficiency.	Ordinary repairs. The amount required to write off the book value of a displaced asset. Sum to cover depreciation resulting from wear and tear, obsolescence, etc. Expenses of an exceptional nature, which have been incurred in the purchase of machinery or plant.
Cost of indicators, recorders, regulators, and other similar assets.	Annual depreciation. Repairs.
Cost of installing telephones, electric light, fixtures, or fittings, etc.	Depreciation. Amount incurred in the maintenance of these assets.
The original payment for the goodwill of a business.	A percentage or proportion of the first cost, each year.
Preliminary expenses incurred in the formation of a limited liability company.	The whole amount (as soon as possible), preferably in about four annual instalments.
The amount representing discount on debentures issued by a company.	A portion at the end of each financial year.
Wages paid to any of the dyer's employees in connection with building extension operations, repairs to machines, etc.	An adequate sum to reduce the book value to the estimated value.

From Dyer and Calico Printer.

book, as the case may be, to a property account opened in the private ledger, this ledger entry giving the date, brief particulars, and the folio. Legal expenses incurred during the purchase of property may also be treated as capital expenditure and debited to the property account for the time being, although this amount should be written off as speedily as possible by crediting the asset account and debiting the legal expenses or professional charges account. Sums spent on the upkeep of premises should, however, be treated as revenue items and recorded on the debit side of the property repairs account which should be kept distinct from the general repairs account. In the case of freehold property, the ground rent should be charged direct to profit and loss, and should not be recorded in the property account at all, and in the case of leasehold property an adequate sum will have to be written off the book value each year to provide for the effluxion of time and the consequent decrease in the real value of the lease.

The above table will assist the dyer to discriminate between capital and revenue expenditure.

The accuracy of the financial accounts depends in large measure on the proper allocation of the expenditure, as also does the efficiency of the dyer's costing system. The next instalment of this series will indicate the steps to be taken for the institution of a suitable method of costing.

The Principles of Costing

The system of costing which has been set up is of such vital importance that it is really astonishing to find many dyers still maintaining obsolete methods of determining the cost of conducting the various operations. It is no exaggeration to say that the majority of businesses which find their way into the receiver's hands could have been saved by the adoption of a simple and suitable costing system, and every receiver in bankruptcy could relate stories about the surprising facts discovered regarding unsuccessful trading concerns—facts which were directly responsible for failure and which did not come to light in time to prevent serious consequences.

At present, it is true, the dyer is forced to reduce his management and working expenses to a minimum consistent with the maintenance of business efficiency, but to hesitate in instituting a suitable system of costing because of the supposed expense involved is suicidal, for the necessary expenditure, trifling as it may be, is without a doubt one of the most remunerative kinds of insurance the dyer can command. It is an insurance against serious errors, irregularities and fraud, and in the vast majority of cases the actual expenditure involved in setting up and maintaining the system is much less than that required in any other kind of insurance, especially in proportion to the benefits to be derived.

Small Profits

Generally speaking, the dyer is compelled to execute orders at a very fine margin of profit, and has to meet keen competition. Consequently, the systematic tabulation of the facts and figures about the business is a necessity. But the figures must be in a form quite easy to understand, and should be calculated to make easier the conduct of the daily routine and to expedite matters at the end of the financial year. The dyer who knows his costs and bases all estimates and quotations on them is almost certain to score in the long run over he who makes mere guesses, and the dyer who is content to wait until audit time before any serious attempt is made to find out the amount of net profit he has realized, or the extent of his losses, will most likely discover that certain work has been done below actual cost, and he will be unable to develop or suppress certain lines just when such action is warranted.

Costing Systems

The only really retarding influence to a universal application of costing is the lack of uniformity in framing and working the system. Whereas, for example, one dyer has one method of determining the amount to be charged against the periodical profits in respect of the depreciation of wasting assets employed for profit-earning purposes, another dyer has another method of arriving at these figures, while many dyers consider it best to ignore depreciation altogether. That the method of spreading and apportioning the various business expenses constitutes a somewhat technical aspect of cost accounting cannot be denied, but as applied to the specific requirements of the average dyer, this need not be a bugbear.

The records and statistics will have to be arranged and tabulated in such a way as will enable comparisons to be readily made with previous periods. It will not, however, be necessary to distribute such items as interest, rent, etc., over the different jobs, although the time spent on each job will have to be recorded and charged against the particular job or contract. The cost of any contract or work undertaken by the dyer will consist of the outlay in the form of materials and labor, together with the charges incurred in the process, all of which must be covered before any real profit can be made. The term "prime cost" which is frequently used signifies "first cost," and refers to the cost of materials and labor and such direct expenses as rent of the business premises, rates, taxes, insurance, depreciation, heating, lighting, foremen's wages, etc., also the cost of maintaining mills, recorders, indicators, regulators and other instruments in proper condition. The total cost of any job will comprise the prime cost plus the "on cost"—such as office expenses, salaries, traveling expense and commission, selling expenses, bad debts, etc. The price charged to the customer must be sufficient to cover the cost of the materials used, the labor involved, the direct expenses, the fixed charges, and an adequate profit.

As an illustration of the principles involved, we will suppose that a dyer has received instructions from a customer to dye a certain fabric, and that it is desired to ascertain, among other things, the time actually spent on the job, so that a proper charge may be made for the work

(Continued on page 345)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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CALENDAR OF COMING EVENTS

Annual Meeting
December 4, 5—Boston.

* * *

Exhibition of Color at the Museum of the Peaceful Arts, 220 East 42nd Street, New York. Starts January 2nd and continues several months.

SOUTH CENTRAL SECTION MEETING

THE South Central Section of the A. A. T. C. & C. held their regular Spring Meeting at the Hotel Patten, Chattanooga, Tenn., on Saturday evening, April 25.

During the serving of the banquet an enjoyable entertainment was rendered. The meeting was then called to order by the Chairman, and minutes of the previous meeting were read and approved. The treasurer then presented his report.

The following were elected members of the Sectional Committee:

L. L. Oakey,
National Oil Products Co., Chattanooga, Tenn.
Harold Schroeder,
Dixie Mercerizing Co., Chattanooga, Tenn.
C. A. Schier,
Burkart-Schier Chemical Co., Chattanooga, Tenn.
T. Clendenning,
Jacques Wolf & Co., Chattanooga, Tenn.

R. C. Staples of Mathieson Alkali Works, Chattanooga, was appointed member of the nominating committee.

A letter from Mr. Walter M. Scott, Chairman of the Program Committee of the National Association to be held in Boston December 4 and 5, was read and the Chair requested the Sectional Committee to serve with him in carrying out the suggestions of Mr. Scott in regard to the program of the National meeting.

The following interesting and instructive papers were read:

"Dyeing and Finishing of Rayon Fabrics" by Mr. E. B. Cooper of DuPont Rayon Co.

"The Application of Naphthols on Cotton Yarn" by Mr. S. H. Williams of General Dyestuff Corp.

The papers provoked an interesting and instructive discussion.

It was suggested that our Summer Meeting be held at the Signal Mountain Hotel, Signal Mountain, Tenn.

The meeting was then adjourned.

Respectfully submitted,

J. D. Mosheim, *Secretary.*

Proceedings of the American Association of Textile Chemists and Colorists

Dyeing and Finishing of Rayon Fabrics

By E. B. Cooper
Du Pont Rayon Co.

IN both hosiery and underwear knitting mills it is not an unusual thing to have the dyeing and finishing plant as an integral part of the manufacturing organization. In fact it is more common than uncommon—especially in hosiery.

When we enter the field of woven fabrics we find the general tendency to be exactly the reverse of this. That is—the grey goods mill usually markets its product "as is" to or thru a converter who dyes and finishes in varying sized lots—to meet the needs of a specific customer. Of course in this case—there is always an occasional exception. Specialty fabrics such as velvets, plushes and laces are almost always prepared for marketing within the producing organizations.

The organization which does dyeing and finishing is faced with an intricate problem. The variables encountered are almost endless and the methods used to overcome these are of course as variable as the problems. During recent months three types of fabrics have had a large yardage output in one form or another. I am referring to crepes, twills, and alpacas.

Millions of yards of all rayon crepes have been marketed in various constructions, either plain dyed or printed. There have been combinations in which cotton was used in the warp and rayon crepe twist in the filling.

Twills have been made of almost every kind of rayon in both warp and filling and in many good and some poor constructions.

The alpacas have been more stable in construction—usually being a combination of cotton warp and a rayon filling.

In handling rayon crepes the finisher must be able to determine several very important facts in the past history of his raw material. He must know what type of soaking solution the throwster used in pretreating the crepe yarn. He must also determine the nature of the warp sizing material used as an assistant to weaving. The approximate turns per inch in the filling is of importance as well as the stretch which has been applied to the warp. It is perhaps a little unnecessary to say that the dyer should ascertain the kinds of yarn in both warp and filling—but some costly failures would have been averted by this simple foresight.

The pre-treating solutions for crepe throwing contain one or more of the following—wax, gum, glues or gelatin, mineral or vegetable oils or sulfonated oils; starches or starch derivatives. The warp sizes are also made from this group of materials—so that a satisfactory scour or desizing treatment for one will take care of the other. Now by looking over this list we find the materials fall in two main classes one of which will be water soluble in the presence of an emulsifying agent and the other of which will be insoluble in water. Essentially everything but the pure starches will be removed by water. The starches will not be removed readily by water.

When the finisher finds that no starch is present in his cloth he may then proceed with an ordinary soap—soda ash scour or use some of the various sulfonated oil solvents or penetrants in combination with a mild alkali. The scour should be as mild as is possible to obtain the necessary cleansing of the fabric. Such a scour will rarely remove heavy grease stains—therefore these must be "spotted out"—usually at the grey-goods mill.

When starch is present in the cloth a different line of attack generally is used. This method is the use of enzymes for the purpose of converting the not easily soluble starches to soluble sugar-like materials. Some enzymes are said to be of great assistance in removal of glues and gelatins. Essentially the concentrated enzyme is purchased and diluted with warm water. The cloth is passed thru this solution at the required temperature and allowed to stand for a period of time sufficient to allow the reaction to take place. The optimum temperature for such reaction is between 120° and 140° F. The time varies from a few minutes up to as much as 24 hours. It is interesting to note that one size manufacturer has placed on the market a size material which is said to be completely removed by the use of a solution of ammonium per sulfate, for a relatively short time.

Some finishers feel that the use of an enzyme solution on all material gives insurance of better and safer results. These people usually feel that hand of the finished goods is improved. The point, however, seems to be open to plenty of discussion.

In finishing crepes it is of course necessary to release the twist of the filling yarn in order that the "pebbly" appearance may be obtained. Some finishers accomplish this to their satisfaction with only a malt and a scour prior to actual dyeing. Others introduce a special treatment of either acid or alkali early in the processing for the purpose of inducing shrinkage. Temperature and concentration control are essential in these treatments to prevent deterioration of the fabric.

One of the problems in crepe finishing is prevention of "cracks" and break marks. The surest way of preventing such troubles seems to be flat handling, altho some finishers allow the goods to fall loosely in an open box following their first treatments—regardless of its nature.

Essentially then the first treatments are designed to remove impurities and release twist in the filling.

The dyeing is done in rope form by practically all finishers. In this process the important considerations are selection of dyestuffs and method of application. It seems to be a general practice to start cold and finish at a relatively high temperature. Glauber's salt is usually used to exhaust the bath when necessary. In general the deeper and fuller shades are dyed at higher temperatures than the lighter shades. Level dyeing can be obtained in most cases if time and care are taken.

Following the dyeing the cloth is extracted to remove excess water.

Some finishers dry the goods and others do not—while another group falls in between by partially drying. It is generally recognized that fast drying at a high temperature tends to make the goods harsh and papery. Drying under tension increases luster and is harmful to the "hand" of the goods.

Following the extraction—a softener is usually applied. This may be applied at almost any stage between extraction and framing, depending upon the flow chart of the plant. The next step is tentering of the goods. In this process the goods are brought to width and dried ready for folding. Here it is essential to use as little heat and stretch as little as possible, in order that the "hand" be not impaired.

Twills and Alpacas

The method of handling twills and alpacas is fundamentally different from that of crepes. There are two reasons for this: (1) the nature of the cloth and (2) the price received for the work.

In this type cloth it is also essential to insure removal of sizing material. The problem is simplified by the more open construction and the low twist of the yarns usually involved. In this type materials practically all work is done in either jigs or padders—the jigs being preferred by most finishers, for average shades and weights of goods.

Work is prepared for dyeing by being batched up in shells of several hundred yards each, the amount depending upon the weight of the cloth being handled. It is customary to start the processing by one or more "ends" thru an enzyme solution at between 120°—140° F. It is desirable to allow some time to elapse following this process—however some people successfully finish without any appreciable lapse of time. A warm water wash usually follows the malt treatment and in some instances a scour bath may be set up in the line so that the goods make one or more passes in making an "end" thru the machine. It is absolutely essential that tension be limited and that creases be kept out of the goods while being put in a shell. It is almost axiomatic to say that once a crease is developed in a piece of goods it will always remain as a streak in the finished goods. Some finishers are wont to overlook this fact—believing that the effect can be overcome. It is however a well known fact that rayon is easily distorted while wet and that distortion produces varying dye absorption properties. The presence of creases in dry goods sometimes appear as marks in the finished goods altho not to the extent of those produced by wet creasing.

In the jig dyeing, about the only limitation is that of the particular dyestuffs in the formula. Most dyers start dyeing at or below 120° F. The dyestuffs are added in several portions, usually giving the goods two or more "ends" between each addition. It is general practice to then raise the temperature to the range required for the shade being produced, giving an "end" or two on the way up. The bath may be exhausted by the use of Glauber's salt or even common salt in some instances, dependent upon the cloth being handled. In general the lighter shades are dyed at a lower temperature than the fuller or deeper shades. Some of the light shades may be produced without salting when a properly balanced formula is used. Some dyers use temperatures well toward the boil when attempting to produce levelness in deep shades.

The finishing process consists in passing the dyed material over a tenter frame or thru a palmer—or both depending upon the equipment available. It is essential that as low a temperature as possible be used and that the tension be kept to a minimum to prevent a "papery" hand in the finished goods.

The alpacas fall in the general class of materials which are treated in the manner just outlined.

When either class of materials are to be dyed for a given purpose where fastness is essential—vat colors may be used with the necessary variations in the dye procedure.

In special cases where specifications permit, topping of fabrics with direct dyes is resorted to—for bringing to required shade.

Mention was made of the fact that the scour and pre-treatment in general in woven fabrics was designed to remove impurities. It seems worth while to state that the importance of the success of this step is very great. Take for example a cloth containing a size made from oil and either glue or gelatin. Should the pre-treatment be deficient in material or time there is a possibility of some of the oil remaining in the goods. If the amount of oil were small and its distribution absolutely uniform then its importance would be much less. There is always the chance of partial oxidation of materials, when goods are stored over a long period of time, in such a manner that uneven removal results. This condition is almost sure to cause trouble to the finisher who has a process designed to barely "get by." Uneven removal of a non-oxidized oil gives the same result.

The enzyme treatment for starch removal is subject to much variation as mentioned. When concentrations, time and temperature are carefully planned and controlled the results are positive. Finishers are in the same class as all business in trying to speed up and cut down costs. Sometimes this leaves starch in the goods going to the

dye bath. Instances have been observed in which groups of warp ends seemed to show dye resist. A qualitative test on the cloth showed starch to be present in this place. Removal of the starch allowed a subsequent redyeing of the piece to a perfectly marketable piece of goods.

Spun Rayon Fabrics

Probably the healthiest of the newer infants in the new fabric field are made from spun rayon. Owing to the nature of the material almost every conceivable mixture has been made. It lends itself to cross-dyeing and novelty effects.

Finishing of this type of goods is a relatively new art. It is handled similar to cotton in the weaving mill with the result that the combination of sizing material and tension produce a close heavy material. The major problem involved in this class of material is opening the yarn so that the cloth will have a "lofty" feel. Scouring and desizing are carried out along the general lines employed for other fabrics, however the treatments are a little more severe and in the case of the desizing more time is allowed.

Dyeing is usually carried out in the rope form in an open box. There is little trouble encountered in obtaining uniform dyeing and level shades. The procedures follow along the general lines previously stated. Finishing is very important. The cloth must be dried slowly and at a low temperature with little or no tension to avoid harshness and high luster. Some people use sulfonated oils to aid in the softening altho this is not necessary when the cloth has been properly handled.

This is intended as only an outline of general methods used in a few cases and little or no detail is included. Almost any one step in any of the various procedures are food for years of thought and study—but there is one thing that is important in any finishing or dyeing. It applies to every phase of every operation. That factor is "control." It is just as important to have a procedure well in hand at all times as to develop that procedure. *"Control"* insures the daily repetition of a series of simple operations in a definite manner. It allows dyers and finishers to maintain schedules and quality of product. In fact it is probably the one thing that comes nearest to answering the dyer's prayer for success.

The Application of Naphthols on Cotton Yarn

By S. H. Williams
General Dyestuff Corp.

As this subject covers all fields and methods of dyeing, including hand tubs, short and long chains, continuous warp dyeing, reel machines, and all pressure types, I have decided to confine most of the following remarks to pressure dyeing as the majority of Naphthol work done thru this section is accomplished on pressure machines.

Technical information regarding this group of colors has been brought before the attention of the textile trade in such an expert manner it will be rather difficult to throw a great deal of new light on the subject at this time.

Before touching on the detailed dyeing methods, I wish to call to your attention the increasing commercial value of this line in the fast color field.

A few years ago a Naphthol was considered only for red shades but the recent, new developments have placed at the disposal of the Fast Color dyer a range of colors from Yellows to Blacks, including new Blues, Violets and Browns, that are fast increasing in importance.

For a dyer to be successful with any group of colors he must first learn their peculiarities and properties. The Naphthol dyer, after learning the various types and application properties, has very little trouble in applying them successfully to the machinery he has available.

One mistake frequently made in Naphthol dyeing is an attempt to cut down the running time of some of the various operations which is liable to produce a finished dyeing not having the proper fastness to crocking, chlorine, or washing.

The process can only be shortened when the dyer has complete knowledge that the short cuts taken will in no way sacrifice the proper fastness of the colors.

To obtain the best possible results on pressure work, the following steps should be observed:

1. Correct wetting out of the material.
2. Dissolving the Naphthol to a clear solution.
3. Impregnating the material.
4. Clearing the Naphtholated goods before coupling.
5. Developing.
6. Rinsing and soaping.

1. Wetting Out the Material

This is generally done with a lime resisting wetting-out agent, such as Nekal, that will work in conjunction with the Naphthol, 12 ozs. per 100 gallons liquor being sufficient. The temperature of the wetting-out bath is the same temperature that should be held during impregnation.

The dissolved Naphthol is added to this bath, no special precaution being necessary in regard to how it is divided when adding.

2. Dissolving of the Naphthol

This step should be watched with care, as, should the Naphthol not be perfectly dissolved, the dyeing will crock to an unusual degree. The alcohol cold dissolving method has met with universal approval thru its simplicity. The Naphthol is pasted to a thin paste with the alcohol and the dissolved caustic slowly added while stirring. The point to watch in this procedure is to use only part of the caustic that it requires to run the formula in making this paste.

Generally speaking, 3 ozs. of Dry Caustic is sufficient to dissolve 1 lb. of any of the Naphthols. Should an excess of caustic be used in pasting, a separation takes place which can only be cleared up by further diluting the paste with hot water containing small quantities of alcohol and soluble oil.

The balance of the caustic not used in pasting is added to the machine or dissolving tank to sharpen the liquor.

3. Impregnating the Material

The time of impregnation is from 30 to 45 minutes and the temperature generally ranges from 100° to 130° F.

Use of salt in the impregnation bath.

Experiments on pressure machines, such as Franklin, Obermaier, Thies and Craig Hornbuckle, to improve the fastness to crocking of Naphthols have been extensively carried out with excellent results in regard to the use of common salt in the naphtholating bath.

The importance of properly exhausting the Naphthol bath by means of salt leaves the packages in a cleaner condition for developing and less amounts of Naphthol will be carried over to the rinsing bath.

The substantivity of the Naphthols is considerably increased thru the additions of common salt, which also effects a saving in Naphthol.

The common salt as a concentrated solution is added slowly to the Naphtholating bath after the material has been naphtholated for 15 minutes. This allows the Naphthol to be taken up slowly and uniformly.

The amounts of salt to use depend upon the substantivity of the Naphthol employed:

8 lbs. 4 ozs.	per 100 gallons	with AS-SW and AS-BR
16 lbs. 8 ozs.	per 100 gallons	with AS-TR
41 lbs. 4 ozs.	per 100 gallons	with AS-RL and AS

These are the maximum amounts to use. Should they be increased, there would be danger of salting out the Naphthol, thereby causing the dyeing to crock badly.

4. Clearing the Impregnated Material Before Coupling

A salt rinse generally follows the impregnation bath, 30 lbs. of common salt per 100 gallons being necessary. This treatment is generally repeated, each rinse being in a fresh bath for at least 10 minutes cold.

It will be found on most pressure machines, if the developing is to be done in the same compartment as the impregnating, that the second rinse is necessary in cooling the machine to the proper temperature for developing.

5. Developing the Base or Fast Color Salt

As the fast color salts are used more extensively than the bases, due to the simplicity in handling them, I will not dwell on the subject of diazotizing the various bases.

The coupling between the Naphtholated material and the Fast Color Salt is a simple procedure. The salts are dissolved in either cold or lukewarm water, some with the aid of small amounts of acetic acid.

These dissolved solutions are not added to the machine slowly like ordinary dyestuffs. It is best practice to add the total quantity to the machine and then start the pump, running the machine from the inside of the package out.

If this solution were to be fed on slowly and it contained a combination of two salts not having the same coupling power, it would be impossible to check results, as the coupling power of the naphthol would be taken up by the quick acting salt and the slow coupling salt would not dye.

The developing bath is generally run from 15 to 30 minutes, depending on the combination to be dyed. As a general rule, the developing action is rather quick with the exception of the Blues and Blacks, which are somewhat slower.

The developing action can be slowed down to some extent by additions of acetic acid to the bath.

6. Rinsing and Soaping

A cold rinse after developing is imperative to remove the excess fast color salts.

On machines having a dehydrating attachment, it would not be advisable to dehydrate the material without this first rinse, as some of the salts, if not rinsed off, would decompose during this operation and cause spots on the yarn that would be hard to remove in the soaping process.

Souring the material is good practice and should be followed by a hot wash with soda ash, and a boil with soap and alkali, either soda ash or caustic. The soap should be rinsed out hot and a final cold rinse given.

The soap could be replaced in finishing by a straight combination of a caustic and soda ash boil.

The correct finishing of a Naphthol Dyeing insures its proper fastness to crocking and shortening the finishing process is never advisable.

Dyers of yarn are sometimes puzzled in figuring a Naphthol Formula taken from color cards. The figures generally stated in Naphthol literature are given in grams per liter. The question often asked is does the material to be dyed enter into the question of calculating the amounts of Naphthol to be used, or should all such calculations be based on the volume of liquor entirely.

Working with Naphthols having the greatest affinity for cotton, such as AS-SW, AS-BR, AS-TR, in short liquor ratios, it would be advisable to alter the amounts of Naphthol used in accordance with the pounds of material to be dyed and not figure the formula in grams per liter.

This is explained if a dyeing of one of the types mentioned were made in a pressure machine of 500 lbs. of cotton and the next order the dyer received was for 250 lbs. and had to be dyed on the same machine, the formula would be cut accordingly, as these Naphthols are exhausted fairly well by adding salt and are taken up by the yarn, even

tho the amount of water in the machine remains the same. Naphthols such as AS would have to be figured mostly on the volume of liquor having very little exhaustive properties.

Working with standing baths hardly comes in question in package machine work in short liquor ratios.

The proper amounts of base or Fast Color salt to use in all formulas are always figured on the amounts of Naphthol employed. These figures are given out in all Naphthol literature.

Mixing of the Various Naphthols

The mixing of Naphthols having nearly the same degree of substantivity offers no serious problem and is done generally in practice.

If a shade could be matched by using two Naphthols and one salt, it would offer a better working formula than by using one Naphthol and a mixture of two salts.

Mixtures of two bases or two salts are advisable if the types employed together are of the same coupling power, and have the same stability.

Some of the bases and salts vary so widely in coupling power and stability it is not advisable to mix them without knowledge of how these combinations will work on the various machines.

The type of machine and dyeing play an important part in regard to the advisability of running such combinations.

In all cases where such mixtures are used the bases should be first diazotized separately, and the Fast Color salts dissolved separately before mixing.

Penetrants or oils should not be put in the developing bath, as these assistants would rapidly decompose the diazo solution.

The stripping of a Naphthol Dyeing is sometimes a dyer's problem and as the various combinations strip differently, no general method has been accepted.

One procedure that works in most cases is a strong boil in caustic and hydrosulphite, which generally brings the material to a yellow base. If this is followed by a light peroxide bleach, it will give the material a fairly white ground.

One of the latest suggestions for stripping, which has been found to be effective, is by boiling the material with 10% sodium sulphide and 5% hydrosulphite.

The Naphthol Colors being more positive in their dyeing actions than Vats have met with the approval of the Fast Color dyers, as repeated dyeings are easily checked if the necessary steps are carefully observed.

LOWELL TEXTILE JUNIOR SECTION

THE Lowell Textile Institute Junior Section held a meeting April 23, 1931, at the Institute. The speaker was Mr. D. R. Weedon, of Hungerford & Terry, Inc. He gave an interesting talk upon the subject of "Certain Phases of the Water Purification Problem." The paper was followed by an instructive discussion. About sixty members of the faculty and upper classmen of the Chemistry and Dyeing Department were present.

Respectfully submitted,

Paul C. Duggan, *Secretary.*

Certain Phases of the Water Purification Problem

By D. R. Weedon

General Sales Manager, Hungerford & Terry, Inc.

EDUCATED Dyers, Bleachers and Engineers realize fully the advantages of always having available, water suited for the particular processing or service involved. It is needless to discuss here the annoyances, troubles and expenses which are brought about by the use of water not adapted to a given operation, or exposing expensive machinery and equipment to water containing damage-causing elements.

Let us now consider the question of what water can be properly clarified, the extent to which clarification should be carried, and the means employed in this process. With a very few exceptions, practically any water can be freed of those foreign elements—be their origin natural or from trade waste—making the filtered water suitable for any definite project. If the proper quantity of raw water is available, the conditions must be studied. This study covers the major variations, if any; the degree of refinement to which clarification is to be carried and the means to be employed in order to accomplish the required results.

There are certain well waters so hard that the expense involved in making them suitable for certain processes would be almost prohibitive. Then, too, there are wells or ground water supplies containing iron in such quantities or of such character that the removal might very well be out of the question from a financial standpoint.

There are streams containing certain dyes which are extremely difficult to completely remove. Fortunately these particular dyes are not frequently encountered. Their presence, however, must be recognized as a possibility and the final results to be obtained from a clarification plant must be scheduled in the light of the foreign elements in the raw water. Most of the industrial trade waste—whether dye, alkali or acid can be readily removed. In fact, some of the most highly contaminated streams in the country are being regularly treated to produce a filtrate of a high degree of excellence.

The problems of daily, periodic or seasonal changes are merely problems and seldom, if ever, develop into insuperable barriers. Of course, experience combined with

chemical and engineering talent of a very high order are required to properly solve these problems. This, however, is available and rarely, indeed, is a raw water supply pronounced definitely beyond the pale. The mere fact that the general appearances or even the preliminary analyses of a given stream indicate tremendous contamination—or the fact that such a stream has never been successfully clarified, does not mean that it cannot be done. Practically speaking, plant failures or treated water that has not met the required specifications, for a given industry, are due to lack of knowledge and understanding of the problems involved rather than the impossibility to satisfactorily treat the water.

Thousands of dollars have been spent for pumping stations, reservoirs, treating basins, together with other clarification equipment and money lost due to the damage caused to goods in process by improperly treated water or to interrupted service, merely because real engineering problems have been entrusted to those without the necessary knowledge.

Naturally, similar conditions have occurred in other lines of endeavor, but there have been many in the water clarification field. Actually the instances where a given water cannot be made entirely suitable for any industry, no matter how strict the filtered water requirements may be, are so rare that they may be disregarded.

The degree of clarification to be attained deserves careful consideration. Let us assume that highly contaminated streams such as the Passaic River, the Delaware River or the lower reaches of the Blackstone River, can be treated to give, for example, a total hardness of 2.5 p.p.m., total iron of 0.03 p.p.m., turbidity of 2, color of 3, suspended matter 0, and residual alumina 0. Such results can be obtained but are they commercially justified for certain industries? Here, the conscientious engineering firm draws upon past experience and knowledge of the industry being considered. The conclusion is a clarification plant designed to meet the demands of the particular client involved, rather than one of excessive first cost entailing heavy operating and maintenance expenses.

It is quite easy to discuss superficially the general question of water clarification. Likewise, it is not difficult to lay out a water clarification plant which ofttimes, regardless of expense or interruptions to service, may perform in a fairly satisfactory manner. However, it is only after years of conscientious study and research that advice of a reliable sort can be given. Such knowledge is possessed by few.

Woolen and worsted, leather, cotton or rayon and silk dyeing and bleaching, together with paper or rayon manufacture—with the various grades of each—must have water suitable to the individual needs. While it is true that many industries would use water practically identical to another, the important point is that the situation must be thoroughly comprehended and realized. It would be ruinous for a rayon manufacturer to try to operate with water which might be entirely suitable for a raw stock woolen dye house or perhaps a manufacturer of ordinary paper. Conversely, it would entail needless expense to produce water as outlined in the illustrative specification above for a low grade cotton or wool dye house.

Only from long experience and careful study covering a period of years have these data accumulated. Happily, however, they are available, as is also a thorough understanding of the means and the process needful for producing the desired results.

Let us then consider for a moment a sparkling clear well water with a high total hardness. By high hardness, I mean possibly 30 to 40 grains per gallon. Assuming that it is necessary to treat only a small quantity of this water, it is probable that the softening or calcium and magnesium removal, would be accomplished by the use of a pressure type softener. This would usually consist of a steel tank of the proper size with suitable control valves, filled with Inversand.

The exchange of calcium and magnesium for sodium carried on by the zeolite Inversand is quite generally understood. If a large quantity of this hard water must be treated, it is quite probable that the preliminary treatment would consist of treating the water with lime or perhaps lime and soda. Such treatment would be expected to reduce the total hardness to approximately 5 grains per gallon.

Assuming that water with a hardness of practically 0, or worded differently, 100% soft, is required. The removal of the 5 grains of hardness remaining after the lime or lime and soda treatment would be removed by passing through the Inversand bed as above mentioned.

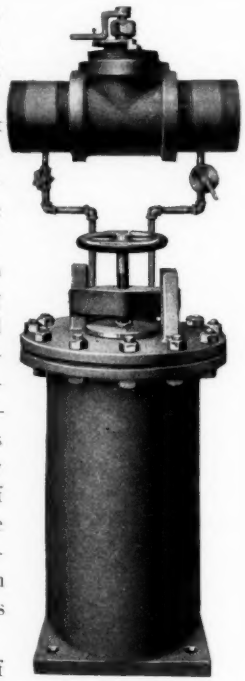
Assuming that a well water contained iron of an objectionable character or quantity, a suitable treatment can be readily specified. It might consist of lime treatment, aeration, other types of chemical treatment, filtration, special iron removal zeolite or a combination of these processes. No guesswork is necessary. A study of the raw water being comprehensively complete chemically, will produce the proper answer.

Assuming a surface or well water with an initial hardness ranging perhaps up to 15 grains per gallon of any reasonable quantity, an Inversand softener would ordinarily be recommended thus avoiding the complications of a double system.

It might be well to mention in passing that wells or springs near rivers do not necessarily have the same characteristics as the nearby stream. As a rule,

river beds seldom leak. It is also a fact that the water level in a well located near a stream might vary considerably from the water level of the stream. Either it could be higher or lower. Chemically, we would also expect tremendous differences between the two.

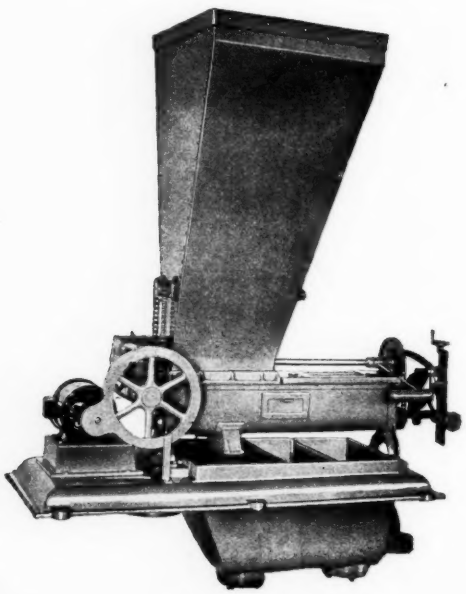
Considering now the question of actual clarification as differing from calcium or magnesium and iron removal, we face the problem of removing suspended matter, turbidity and color. The filature should be alum-free. Let us assume that the study of the raw water and an understanding of the requirements in regard to the filtered water, indicate that chemical treatment, a sedimentation period followed by filtration is necessary.



Proportionate pressure type chemical feeder

There are chemical feeders of various types. Accompanying this article are cuts showing one of the pressure type for connection direct to a pressure service line and the other being motor driven, dry type feeder.

In general, the pressure type feeder would be used for small installations. Solution type feeders are available for small installations but in general would be used on those of medium size.



Dry chemical feeder

The dry type feeder as illustrated is used in connection with plants of practically any size but they are particularly adapted to the large installations.

The proper type for each installation must be carefully selected by those competent and trained not merely from a standpoint of mechanics, but so that the proper chemicals for the particular requirement can be handled satisfactorily. The degree of accuracy of the chemical dosage must be understood and that type of feeder employed which will best accomplish the desired results with as little complication or attention as possible.

Thorough mixing of the chemical dosage with the raw water is necessary. It has been found that properly baffled mixing chambers through which the incoming water flows rapidly, are more satisfactory than the revolving agitator with concomitant power consumption and maintenance expense.

The water, after entering the basin proper, should move slowly, allowing coagulation and settling. The sedimentation basin should be of relatively large area and comparatively shallow, rather than small in area with greater depth. The water should be taken from the basin at a point near the top and thus avoid stirring up the sludge or carrying excessive sludge to the filters.

There have been installed a few vertical basins 40 feet or even 60 feet in depth. The water enters near the top, is deflected down by means of baffles and then flows upward to the outlet at, or near, the top. This, of course, means that the flow of water is against the tendency of the foreign elements to settle to the bottom. This is contrary to the law of mechanics and gravity and such basins are comparatively ineffective.

In addition, extra pumping costs are many times involved unnecessarily, if the vertical type of basin is used.

Naturally the subject of proper chemicals is very important. Here again research and experience are invaluable. Usually alum is the element used for color coagulation. There are, however, different forms carrying different prices. The type of feeder and form of alum to be used are interrelated. It is important that the right procedure be followed.

The next point is that the alum, even though fed in to the water in a suitable quantity, can only perform its functions under certain conditions. These conditions must be thoroughly understood. The means of securing and maintaining these conditions with least possible attendance and supervision, at reasonable expense, are features upon which exact

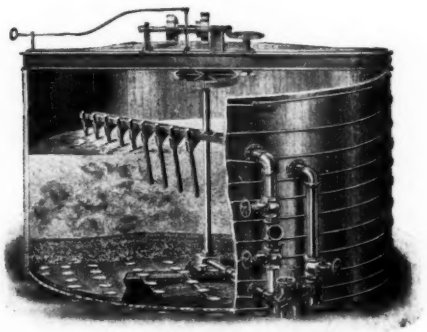
knowledge is necessary. Fortunately the required data are available.

So far this discussion has dealt with what might be termed—preparatory or preliminary steps of water clarification. Be these steps ever so effective, improperly designed or operated filters will fail to deliver really high grade filtrate.

Of course, it must be remembered that many waters can be properly clarified for certain industries, omitting either the chemical treatment, the sedimentation basin or both. Assuming the use of a basin, the ideal layout would allow the water to flow by gravity from the basin through open filters into a clear well or directly to the piping system.

Sometimes space limitations or geographical locations are such that the filters must be placed separately, thus requiring pumping. In this case pressure filters for handling the water from the basin might be indicated.

The type of filter, the methods of handling the water, the number of pumping operations, all must be carefully considered in the proper solving of any efficient water clarification plant design problem.



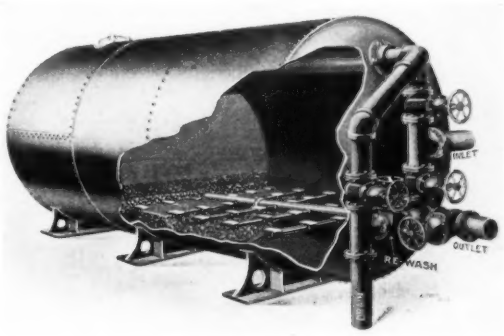
Wash rake filter

The accompanying cuts show types of closed and open filters. The type of filter must be carefully selected if high grade results and long time service without extraordinary interruptions are desired.

Under certain conditions the pressure filter as illustrated can be applied successfully. In other instances open or gravity filters are essential.

The size and depth of the various gravel layers have an importance far beyond that usually realized. In fact, there are a great many filters in existence that indicate that the most important functions of these gravel layers are not as widely understood as should be the case.

The size and depth of the sand layer must be accurately determined, in order to secure the greatest possible capacity for retention of the foreign matter carried by the water passing through the filter. This

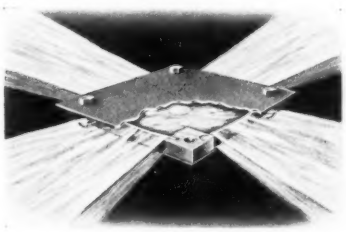


Horizontal pressure filter

capacity for retaining water impurities depends tremendously upon the effectiveness with which the sand layer can be kept clean.

This brings up the subject of periodic backwashing. In order that a uniform flow of wash water may be assured, there has been developed a special self-cleaning, non-clogging valve which forms part of the strainer system in the bottom of the filter. Such a valve is shown by the accompanying cut.

It is obvious that if some form of orifice is utilized in the strainer system, which fails to remain absolutely free and clean month by month or year by year, the flow of wash water will vary and will result in a filter bed not uniformly clean. Eventually "mud balls" or actual "dead spots" will form. Filter beds developing these faults must be dug out and the filter repacked. During the periods of gradual lowering effectiveness, inestimable damage may be done due to passage of turbidity, color, iron or residual alumina through the dirty or inactive filter bed. Too much



Brass and monel expansive part Hungerford sand valve washing

importance can not be placed on this subject of keeping the filter bed clean. In fact, this is one of the most important of several vital features in connection with filter design. Too many times the value of properly cleaning the sand bed has been disregarded.

Actually, it has been found in many instances, that it is impossible to pass enough water up through the gravel layer to properly wash the sand without in turn

disturbing the fine gravel layer. The realization of this feature made necessary the development of the combination air and water wash and the wash rake type of filter. With the combination air and water wash, a reasonable volume of water is passed up through the gravel and sand. An air current is introduced just above the layer of fine gravel and at the bottom of the sand layer. This air current combined with the wash water make possible a violent scrubbing of the individual sand grains providing a very effective washing arrangement.

One of the accompanying illustrations shows a filter which is washed by means of a suitable volume of wash water together with a revolving wash rake. The revolving rake is driven by a powerful gear mechanism. The fingers on the rake plow to a reasonable depth in the sand bed thus mechanically stirring the sand at the same time that the wash water passes through the bed. This arrangement provides a very effective washing.

The steps necessary to absolutely prohibit the appearance of residual alumina in the filtered water can be taken. It is necessary, however, to know just what precautions are required. The rate of flow through the filter must be determined. The treatment of the filtered water to limit, in so far as possible, pipe corrosion must be given attention. These and many other features must be carefully considered.

It is beyond the scope of this article to deal definitely with each individual step in the clarification of one certain water making it suitable for an individual industry. Rather has it been the intention to broadly outline some of the major phases of the problems which face the water clarification engineers day by day.

Many streams and rivers grow more contaminated year after year. Many industries demand always greater refinement in foreign matter removal for their process water. This combination of circumstances has made possible the development of a chemical and engineering organization with experience sufficiently wide, and knowledge sufficiently accurate and with equipment sufficiently reliable, so that any water clarification problem can be solved and the proper method applied, regardless of how difficult it may appear upon preliminary examination.

Start Planning
for the Next Annual Meeting
Boston—December 4, 5

MAY MEETING NORTHERN N. E. SECTION

THE Northern New England Section met in Riverbank Court Hotel, Cambridge, on May 2. Dr. Walter M. Scott spoke on "Some Unusual Reactions of Cellulose," and Homer C. Riggs of the Rodney Hunt Machine Co., on "Some Recent Developments in Wet Finishing."

Clarence L. Nutting was elected to represent the Section on the committee to nominate officers for the Association. At dinner 34 were present, and at the meeting about 44.

The Outing will be at the Andover Country Club on June 12.

Respectfully submitted,
HAROLD C. CHAPIN,
Secretary.

APRIL MEETING RHODE ISLAND SECTION

THE April meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Friday evening, April 24th, 1931, in the rooms of the Providence Engineering Society.

The speaker, Mr. Ben Verity, gave a very interesting talk on "The Practical Side of Dyeing and Finishing Textiles."

Mr. Verity is Assistant Superintendent of the American Printing Company.

Due to illness, Dr. Robert E. Rose of the DuPont Company was unable to give his talk as planned.

Seventy-five members were present.

Respectfully submitted,
A. NEWTON GRAVES,
Secretary.

Our Research Committee

By DR. LOUIS A. OLNEY

THE American Association of Textile Chemists and Colorists is now in the tenth year of its existence. It was the result of a long felt need for a truly scientific and technical organization among American textile chemists and colorists.

From a group of less than twenty men who had faith in its possibilities it has now grown to an organization of 1400 members with seven local sections and two Junior sections. We believe that its growth has demonstrated its desirability and that its accomplishments up to the present time have justified its existence.

You may have noticed in the front of our Year Book

Presented before the April Meeting of the Northern N. E. Section.

the three objects of our association; the first two of which are as follows:

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any practicable way research work on chemical processes and materials of importance to the Textile Industry."

With two out of three of these objects so intimately connected with experimental work and research it is not surprising that the work of the Research Committee has from the beginning constituted one of the association's most important activities.

The original Research Committee included twenty members chosen by the original nominating committee. It has always included the executive officers of the association, the chairmen of Local Sections ex-officio, and chairmen of all sub-committees. From time to time additional members have been chosen until at the present time there are about forty. The March meeting was the 66th. The attendance at these meetings is usually well over twenty and when one considers the wide geographical distribution of the membership this indicates a remarkable continued interest.

At the very beginning we saw that the most extensive and efficient work could be accomplished through the organization of sub-committees, and at the present time we have eighteen such committees working under the authorization and direction of the regular research committee.

At this point Prof. Olney then entered into an extended discussion of the work of the various sub-committees, speaking especially in regard to that of the Committee on Fastness of Dyed Silk and Wool to Washing and Fulling, also Fastness to Perspiration and Light, going into some detail as to the many difficulties which had been encountered by these committees one way and another.

One of the most recently formed committees, that on Rayon, is actively engaged in a study of many matters concerning the different rayons, all of which will be published at a later date, probably in time for the next Year Book.

Our work has recently received a decided impetus through the grant of $5,000 for one year from the Textile Foundation. With this assistance it has been possible for us to add two full time Research Associates to our staff. Dr. Milton Harris who is located at the Bureau of Standards in Washington and Bertil A. Ryberg at the Lowell Textile Institute.

In addition to the organized work of the various sub-committees special research work is being conducted by our research associates on the following subjects:

Factors involved in the deterioration of silk on exposure to light.

Study of the iso-electric point of wool with the object of determining and checking its determination by several methods, and to obtain if possible, a simple, and practical method for iso-electric termination which will be applicable to the average woolen mill laboratory. Finally, to study the relationship of the iso-electric point to the processing of wool fiber in the industry.

The Carbonization Process as Applied in Woolen Industry

It is hoped by the next Annual Meeting (in December) the study of the subjects will be well advanced, and comprehensive reports in regard to them can be made at that time.

Within the next few weeks another report of the Light Committee will be published in the Proceedings. This report will be in regard to the relative Fastness to Light of 1214 cotton, wool and weighted silk dyeings representing approximately 350 dyestuffs. These dyeings upon the above mentioned fibers have been exposed to sunlight in accordance with the standard sunlight test of the American Association of Textile Chemists and Colorists. Tables showing the classification of the dyeings on the several fastnesses classes and an exposition of the method of classification accompany the report. This report should be of special interest to producers and users of dyestuffs.

In addition to work already mentioned there is one phase of the research committee's activity that scarcely ever comes to the attention of those outside of the committee, namely, many inquiries in regard to special subjects, sometimes from members of the association, but perhaps more frequently from those outside of the association. Many of such inquiries are answered directly but others are referred to Research Committee at their next meeting or to Chairmen of the appropriate Sub-Committees.

The time allotted to me has already passed, but with the chairman's permission I shall be pleased to answer any special questions you may have concerning the work of the Research Committee.

Question: How is the work of our association going to fit in with that of the United States Institute for Textile Research?

Prof. Olney: It will be some time before the Institute for Textile Research attempts any laboratory work of any kind, and I think they will for a much longer time depend upon our association for any work that involves Textile Chemistry, Dyeing, Bleaching and Finishing. We hope that the U.S.I.T.R. will eventually become a well endowed institution, that will be financially able to furnish the necessary funds so that the Research Committee of our association may be able to do for them any research work along the lines of Textile Chemistry, Dyeing, Bleaching and Finishing that they may wish carried out.

We can perhaps visualize five or ten years from now a

$500,000 office, library and Research Building of the U.S. I.T.R. with a whole section turned over to the A.A.T.C.C. for their work. This may be a long way off but if it can be done in England and Germany why not in this country.

This sort of thing will require considerable educational and missionary work directed towards those able to provide the funds, but if each member of our association will become a missionary in this respect it may come sooner than we think for.

In this connection let me again remind you, as I have already done so many times, that as far as our association is concerned the securing of additional Corporation members will aid materially in extending the future work of our Research Committee.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

ALEX. MORRISON,
American Woolen Co.,
Andover, Mass.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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Directing Editor

BLISS MORRIS JONES
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GERMAN CHEMICAL INDUSTRY

THE extent to which the German chemical industry suffered during 1930 as a result of the economic depression existing in the Republic is revealed in a study of German chemical developments during that period which the Commerce Department has just issued.

Trade Commissioner W. T. Daugherty, the author of the study, points out that chemical production fell far below that of the peak year, 1928, and that German exports dropped from a value of $338,198,000 in 1929 to $280,840,000 in 1930, a decline of 17 per cent.

The German Dye Trust, whose output of chemicals represents about one-third of total German production admitted that its sales of fixed nitrogen declined markedly last year. This item, it is pointed out, accounts for fully half of the organization's output. The potash syndicate also reported a loss in business in 1930. Chemical enterprises which supply the building trades suffered as a result of restricted construction—a loss estimated as high as 25 per cent. In contrast to most of the major chemical items, sales of German coal-tar dyes held up relatively well, a development due to changes in style to darker shades and an active demand by certain special customers.

The German chemical industry, the report shows, ranks second to the United States chemical industry as a producer of chemical products. According to 1927 figures, the latest available, about 16½ per cent of the world's total chemical output came from German plants, as compared with 43 per cent for the American chemical industry. In 1930, there were approximately 3,000 plants in Germany manufacturing chemicals employing 320,000 workers. The total capitalization of these plants is estimated to be in the neighborhood of six billion marks.

Because of lack of uniformity in classification of chemicals, the Commerce Department report states, it is difficult to estimate German chemical imports from the United States. It is estimated, however, that these had a value in 1930 of at least $22,000,000. The leading chemical items purchased by Germany in the United States in that year, given in the order of their importance were: Benzol, rosin, phosphate rock, turpentine oil, sulphur, carbon black, borax ore, and borax. It is notable that benzol purchases from the United States increased despite an additional duty and augmented domestic output. Another American item which registered an increase in German imports was phosphate rock. The continued penetration of American chemical plants and processes in Germany according to Trade Commissioner Daugherty, is significant as an indication of the competitive merit of American compared with German chemical process developments.

ANOTHER MILESTONE

A DISTINCTLY progressive and encouraging slant on the development in the dyestuff industry was struck recently in the report given by Colonel Herman A. Metz, Chairman of the Board of the General Dyestuff Corporation. This resume of the past year was incorporated in the annual report for 1930-31 of the Silk Association of America. It might be well to reprint here Col. Metz's brief yet very comprehensive remarks.

"During the past years the demand for faster colors in the silk industry has increased considerably. It is, of course, not necessary to use, for all materials made of silk, colors of a similar fastness to light and washing as are now used to a very large extent on cotton and rayon fabrics, because in most cases silk goods are not exposed to the light to the same extent as cotton materials, and also are not required to stand an excessive washing with soap. Silk materials should, however, be sufficiently fast to light and must in many cases also be fast enough in order to stand a warm soap-bath. Another important item with silk goods is their fastness to rubbing. On weighted goods the fastness to washing is not so important a fact as on pure silk fabrics. During the course of the past year the demand for pure silk goods has increased and prints have again been more in demand than plain shades.

"The dyestuff manufacturers have endeavored with the help of their scientific staffs to place at the disposal of the silk dyer and printer colors which will meet the demand of the public for faster colors, and many new dyestuffs of better fastness properties have been offered to the trade. Discharge prints on pure silk are being produced more and more, and especially for this style of work colors of very good fastness properties are now available and should be exclusively used.

"Basic colors are now practically only employed for colored discharges on goods which are not required to be exceptionally fast to light. As, however, basic colors are also not very fast to rubbing they have for this spe-

cial purpose been satisfactorily replaced in many instances by acid dyestuffs which withstand the discharging agents. A complete range of such acid dyestuffs is now available. For direct prints acid colors are nearly exclusively used, and in this case also the older line of acid colors which, although brilliant, are neither fast to light nor washing, has been replaced with other, newer acid colors of better fastness properties. For ground shades which are to be discharged, many good direct and acid colors are offered which give a perfect white, whereas for wash silks developed dyestuffs are used for ground shades and vat colors of exceptional fastness properties are employed for the colored discharges.

"It is to be hoped that the demand for faster dye on silk continues to increase as on such a high-priced material only the best colors should be used. The difference in cost between a fast and a loose dyestuff is so insignificant, too, in comparison with the price of the material, not even taking into consideration the making-up cost, that it is not worth while considering."

Photographic Printing Process

A most interesting method of embellishing materials has just been made practical and has been put on public view for the first time at the Audac Exhibition, at the Brooklyn Museum. This process is termed "Phototone" and is the newest and latest development of photography as applied to textiles. It requires no rollers, no screens and no blocks for printing. The material is impregnated with a sensitizing solution and used as a film to receive the printing.

The pliability of American dye materials is making it possible to do this work in absolutely fast colors—fast to light and fast to washing—and when applied to such sturdy material as linen it is of incomparable value to the market.

The examples at the museum are on a beautiful quality Russian linen and are used to upholster furniture recently designed and created by Kem Weber. His design for the material is of a bold leaf effect (all-over pattern) in decided contrast of shading.

Perhaps one of the most interesting uses of this process is its adaptability to reproduction of period designs of the old masters, bringing in the minutest detail of shading. It may also be used for photographing the newest view or the most thrilling woodland vista.

Its scope is without limit, although at the moment it may be printed in only one color. Later, it is promised in multitone, which will increase both its interest and its usefulness.

The Salvation Army

Every business and industry is rightly interested in the work of the Salvation Army, for the activities of this great organization reach into every department of life.

The average citizen probably has no conception of the many ramifications of the Army's work. He sees its street corner meetings, possibly knows of its employment bureaus because of the present unemployment emergency. But ten chances out of one he is not aware, for instance, that it has a well developed family welfare department which cares for families in the scientific manner of present-day charity; that discharged prisoners to the number of nearly 9,000 are helped to readjust themselves to the world again each year; that it cares for hundreds of little children in day nurseries and in homes; that it organizes boys and girls into boy scouts and girl guide groups, and works with mothers in the homes to teach them thrift and the better management of their households; that with all this it provides spiritual aid and encouragement to thousands, who but for its concern would sink into discouragement and destitution.

The money that the Army asks represents only a portion of the total cost of the work it does for the city, for one of the tenets of the Salvation Army is that every man who can help himself in any degree shall be allowed to do so. Thus, for instance, industrial homes for men are self-supporting, at the same time giving to hundreds of destitute men shelter, food and spiritual aid.

Never before has the country appreciated the Salvation Army as it has during this difficult year. The centers of the Army's work are the base from which emergency work must be carried on. It is believed that much of the emergency work of the Army will have to be continued for some time—in the meantime the regular activities must be supported.

$3,000,000 Textile School Building

The City of New York has recently erected a new $3,000,000 Textile High School Building. It has up-to-date equipment in all textile departments. In addition to experimental dye laboratory, testing laboratory and analytical laboratories, there is a museum and library for research in textiles, color, etc.

William H. Dooley, principal of the school, is anxious to obtain books, pattern cards, samples of dyestuffs and chemicals for dyeing and finishing.

Pontacyl Brilliant Blue RR

Pontacyl Brilliant Blue RR, an acid dyestuff which produces reddish blues of extreme brilliancy, has recently been developed by the Dyestuffs Department of E. I. du Pont de Nemours & Company. It is said to be extremely fast to fulling, acid and perspiration. It is not only an excellent wool color, but may be used equally as well on both pure and tin-weighted silk.

When dyed on cotton, rayon and silk material, the silk is dyed to a full shade and the vegetable fibers are unstained. On silk and wool union goods a uniform depth and shade may be obtained. Acele effect threads are left unstained.

Pontacyl Brilliant Blue RR is especially recommended for women's wear such as dress goods, sweater yarns, etc. As it may be applied on both pure and tin-weighted silk, it is expected to find considerable use for dress goods, scarfs and similar articles made of this fiber.

(Continued from page 330)

performed. As soon as the customer's instructions have been confirmed, the work will be put in hand, and as far as the works are concerned the job will really resolve itself into so much materials and stores, and so much labor.

Method of Keeping Contract Accounts

Many dyers find it sufficient, for all practical purposes, to find the total cost of the labor expended on each job, but, if desired, the various labor operations may be classified under suitable headings so as to avoid irregularities in time to prevent serious consequences. By the use of time cards for each job, the necessary information can be brought to a head and presented in the most convenient form, particularly if the cards are provided with a number of columns or sections for the analysis.

Time Cards

The time cards should show the customer's name and address, the order number, the nature of the work, and any special terms or conditions attached to the order, the classification of the time charges being made in the inside folding and giving details of the processes and the number of hours spent under each heading. The total time cost can then be worked out on the basis of the weekly rates of pay, and the amount charged against each job.

To ascertain the precise profit realized on a particular job or contract or the loss incurred through undertaking work at a stipulated figure, it will be necessary to keep separate contract accounts, the final balances of these accounts being transferred to the periodical profit and loss account. The cost of the dyestuffs, acids and other materials purchased or taken from stock for use in carrying out a contract will be debited to the particular contract account, as also should the amount of carriage or cartage paid on these goods, and a proportion for the use of machines, regulators, indicators and other apparatus. The wages paid to workers who have been engaged in the different processes will also be charged against the account, while any cash received by the dyer during the performing of the contract will be recorded on the debit side of the general cash book in the usual way, and posted direct to the credit side of the contract account.

As soon as the work has been completed, the balance of the account will represent either a profit or a loss, according to whether it is a credit balance or a debit balance, but where a contract remains unfulfilled at the balancing date the difference between the two sides of the account will have to be enumerated on the balance sheet, a debit balance being shown on the assets side, but a credit balance on the liabilities side. The balance of the contract outstanding upon the completion of the job should be inserted as the last item on the credit side of the contract account and transferred direct to the debit side of a personal account opened in the debtor's name in the sales or customers' ledger.

The mere fact that a contract has been entered into does not, in itself, necessitate any entry being made in the books of account. Directly any colors or stores of any kind, are bought or withdrawn from stock, however, for the purpose of proceeding with the work, the account should be opened and debited with the invoiced cost. Goods taken from stock are usually credited to the sales account, whereas materials, etc., purchased specially for a job should be credited to the personal account of the supplier, unless cash was remitted with order, or upon delivery, in which case the credit entry would appear in the dyer's cash book. A specimen form of completed contract, indicating the nature of the entries to be made in the account, is given below.

An alternative method of keeping contract accounts consists of transferring the cost of the work to the debit side of the debtor's personal account, this account being credited with any cash received before the completion of the job. When this method is adopted, the balance of the contract price outstanding on the completion of the work should be credited to the account and brought down as a debit balance to commence the next period.

Dr.					*Cr.*				
1930			£	s.	d.	1930		£	s.	d.
Nov. 1.	To Balance brought forward...					Nov. 4.	By Cash on a/c.....			
" 3.	" Dyeing					" 17.	" Cheque (settlement)			
" 3.	" Colours									
" 3.	" Carriage									
" 3.	" Acid									
" 3.	" Other Chemicals									
" 8.	" Wages									
" 15.	" do.									
" 17.	" Use of Equipment.....									
" 17.	" Depreciation									
" 17.	" Sundries									
" 17.	" Balance, being carried to Profit and Loss a/c....									
			£	:	:			£	:	:

The Dyer and His Current Account

Owing to the number and the magnitude of his monetary transactions, the average dyer is practically compelled to keep a current account at the local bank, and in conducting this account many points will constantly arise which will call for immediate settlement, so that all the transactions taking place between the dyer and his banker may be recorded in a proper manner in the financial books. In this connection, it is very necessary that the advantages of keeping a current account should be properly appreciated, and that the account should be reconciled with the dyer's own records, while the correct recording of such transactions as dishonored and unpaid cheques will demand special consideration.

How Much in the Bank?

The real object of keeping a current account in the financial books is to enable the exact position of the dyer and the banker in relation to each other to be quite readily ascertained at any time. The principal advantages associated with a banking account are the following:

(1) The dyer need not hoard accumulated sums of money, thereby avoiding a considerable amount of inconvenience and eliminating the danger of loss.

(2) Instead of remaining idle and unproductive, the money can be invested by the bank in the interests of trade.

(3) By means of cheques, money can be transferred in settlement of accounts, owing for chemicals, coloring agents, machines, etc., supplied, or for services rendered to the dyer, and these cheques are not only of great convenience as between business men in the same town or district, but are the means whereby cash can be forwarded to any part of the country. This avoids the need for counting and sending notes or coin.

(4) All cheques and bills received from the dyer's customers can be collected without trouble.

(5) The private credit of the dyer is enhanced as a consequence of a constant banker's reference, and reliable information concerning the financial stability of potential customers may be obtained.

(6) By obtaining permission to overdraw the account, the dyer can secure a more productive return on capital invested in the business, and additional working capital may be found when it is most needed.

Some dyers will be able to pay into the bank all the cash received from customers, including takings, without exception, but in the majority of cases it will be necessary to keep back some of the money for the purpose of defraying pressing works or office expenses or to meet the claims of local creditors. All amounts paid in should be recorded in the bank column on the debit side of the dyer's general cash book, whether the individual items are in the form of cheques, notes, orders, or coin, and these amounts should exactly correspond with those entered on the deposits side of the bank pass book.

Each cheque drawn on the account will be entered in the bank column provided on the credit side of the cash book, these items corresponding with those recorded on the withdrawals side of the pass book. The cash book entries should be carefully compared and checked with those made in the pass book whenever the latter book is available, and it is a good practice to prepare a reconciliation account at the end of each month's work, showing how the two balances have been agreed with each other. This will involve the making out of a list of unpresented cheques, i. e., cheques drawn by the dyer and paid away during the month, but not actually presented at the bank for payment.

Cash Book Balance

To arrive at the correct cash book balance, the total of the unpresented cheques will have to be deducted from the balance standing to the dyer's credit as shown in the pass book, but if the bank balance is an overdraft the unpresented cheques will have to be added for reconciliation purposes. Before attempting to agree the balances, however, it will be necessary to ensure that all charges made by the bank for cheque books, stamps, commission, etc., have been recorded in the cash book. The following is a specimen reconciliation:

	£ s. d.	£ s. d.
Credit Balance as per Pass Book at December 31, 1930.....		265 19 2
Less: Unpresented Cheques, viz.:		
Henry Robinson & Co., Ltd..	15 18 6	
Whitaker & Co., Ltd.....	12 10 6	
James Smith & Sons.....	7 3 8	
Northern Color Works, Ltd..	3 6 2	
		38 18 10
Balance as per Cash Book at December 31, 1930.....		£227 0 4

Some banks balance their books every six months, while others do so quarterly or even monthly, and the dyer will find that his pass book has been balanced and ruled off accordingly. If the account has been overdrawn, that is to say, if the dyer owes a balance to the bank at the end of the period under review, an entry will appear on the withdrawals side of the pass book representing interest plus a commission on the turnover of cheque transactions. This will necessitate a corresponding entry being made in the bank column of the dyer's cash book.

Method of Recording Dishonored and Unpaid Cheques

A cheque carries no definite assurance of payment and should, therefore, be accepted only from persons or firms of established reputation, or of whose integrity the creditor is assured. It is not good business to refuse to accept a cheque from a customer in whose name a ledger account has been opened, neither is it advisable to do so in the case of the cash buyer, providing, of course, the payee has no reason to believe the cheque will not be honored upon presentation at the bank.

Mutilated Cheques

As a rule, a cheque which has been mutilated will be returned by the bank to the drawer, marked "cheque mutilated," or "cheque torn." In some cases, however, the mutilation will be confirmed by the drawer who will notify the bank to pay the amount stated, and when this procedure is adopted the cheque is not returned.

Although any alteration to a banknote automatically renders it void, this is not necessarily so in the case of a cheque. Speaking generally, however, an altered cheque should be refused, whether the alteration is material or otherwise, but if for business reasons a cheque like this is accepted from a debtor it should be seen that each alteration has been signed by the drawer.

With regard to cheques paid away by the dyer, the most important precaution to take is to prevent any alteration in the sum payable, and numerous devices are now available, calculated effectively to overcome any possibility of fraud. For example, when remitting a cheque for £8 19s. 4d., the words "Under Ten Pounds" can be stamped across the face, or if the cheque is for £62 18s 6d. the words "Under Sixty-Five Pounds" could be perforated on the cheque. Some business men now use special paper which immediately exposes any alteration or use of chemicals for erasure. Cheque protectors are also extensively used and may be advantageously adopted even by the proprietor of the small one-man business.

Cheques That Come Back

It often happens that a customer who has settled his account by cheque has not sufficient money at the bank for the draft to be honored. This may be simply carelessness, but the cheque will be returned by the bank, marked "N/S"—meaning "Not Sufficient Funds"—or "R/D"—"Refer to Drawer." The correct method of recording a dishonored cheque in the books of account is explained below:

Let us suppose that on December 31, 1930, W. T. Morgan's account in the dyers' sales ledger showed a debit balance of £35 10s. 6d., made up of three invoices, viz., November 12, 1930, £11 18s. 6d.; December 3, £17 12s.; and December 19, £6, as posted from the day book. On January 6, 1931, an allowance of 10s. 6d. was made by the dyer in respect of certain returned material, and three days later a cheque for £34 2s. 6d. was received in settlement of the account, after deducting 2½ per cent discount to which the dyer consents. On January 12, the cheque is paid into bank and recorded in the bank column on the debit side of the general cash book, but on January 15 the cheque is returned by the bank, marked "N/S." Instead of taking legal proceedings, however, the dyer returns the dishonored cheque to the debtor at once, at the same time demanding payment in legal tender without any discount deduction, and on January 20, notes to the value of £35 are received and immediately paid into the bank. After making the necessary adjustment entries, W. T. Morgan's account would appear as in the table.

The returned cheque would be recorded in the bank column on the credit side of the dyers' general cash book, from where the amount would be posted direct to the debit side of the sales ledger account, as shown. As the amount of discount deducted by the debtor on January 9 would be debited to the discount by way of the dyers' cash book, the item reading "discount not allowed" appearing on the debit side of the personal account would have to be posted to the credit side of the discount account, thereby cancelling the amount previously debited to that account.

When a cheque is lost, the loser should at once request the drawer to notify the bank at which it has been made payable, so that payment can be stopped. In such cases the bank will advise any branches at which the lost cheque may be presented.

SALES LEDGER
W. T. MORGAN

Dr.		£ s. d.	*Cr.*		£ s. d.
1930			1930		
Nov. 12	To Charges	11 18 6	Dec. 31	By Balance c/d	35 10 6
Dec. 3	To do	17 12 0			
Dec. 19	To do	6 0 0			£35 10 6
		£35 10 6	1931		
Dec. 31	To Balance c/d	35 10 6	Jan. 6	By Allowance	10 6
		£35 10 6	Jan. 9	By Cheque	34 2 6
1931			Jan. 9	By Discount	17 6
Jan. 15	To Returned Cheque	34 2 6			£35 10 6
Jan. 15	To Discount Not Allowed	17 6	Jan. 20	By Notes	35 0 0
		£35 0 0			£35 0 0

Technical Notes from Foreign Sources

Precipitating Agents for Color Lakes

A. W. C. Harrison—Der Farben-Chemiker, p. 105, *Dec.* 1930.—An interesting article, of summary but full nature, covering the various inorganic materials for furnishing substrata for lakes, and also those of organic nature, regarding which apparently little is as yet generally known. The process in the inorganic field, at least, is regarded by the author as purely adsorptive in nature. "Green earth," a weathered silicate rock, reduced by atmospheric influences to a soft, powdery consistency, is one important substratum naturally formed, upon which, in suspension, basic dyestuffs are precipitated with rosin soap, or with aluminum arsenite or phosphate. This "green earth" is known, itself, in pigment form as Verona Green. The M. L. B. works have used successfully a procedure which produces an artificial iron silicate (the most valuable component of the "green earth") from sodium silicate, Methylene Blue, sulphuric acid, and ferrous sulphate, the mixing of these components in proper proportion, in solution, precipitating the silicate of iron, together with the dyestuff, as a successful lake substratum. Other compounds forming the substratial bases of various lakes are salts of calcium, ferric chloride, lead nitrate, copper sulphate, manganese salts, chromium salts, those of nickel, barium, strontium, and tin; each compound being most satisfactory in certain cases only.

Complex Color Lakes

Dr. Siegfried Malowan—Der Farben-Chemiker, p. 108, *Dec.* 1930.—A short article, glancing at the use of phosphotungstic, phosphomolybdic, and phosphomolybdo-tungstic acids as the substrata for color lakes. The fact that some modification of such compounds are of themselves already colored increases their usefulness in some cases. Vanadium compounds of the above nature would probably be of great value also, were it not for their comparatively high cost.

Micro-stereophotography

Der Farben-Chemiker, p. 127, *Dec.* 1930.—A short article (illustrated with 4 stereograms) commendatory of the value of preparing stereoscopic photo-micrographs for reference and comparison. Little of details is given, though allusions to this or that point show that the writer (unnamed) knows whereof he speaks.

It is unfortunate that stereoscopic photography as applied to microscopy becomes even more difficult than in its ordinary, microscopic form. Those who have worked with stereoscopic photography, and know its marvelous fascination and its vexatious difficulties, also know well the practical impossibility of obtaining negatives and positives free from defects in one or the other slide, and the distraction of scanning the defect, dustmark or lint or dirt or emulsion blemish, suspended apparently between the eye and subject being viewed. When to this trouble is added the new group of difficulties encountered in any branch of photo-micrography, the same dismal list as above, with the apparently unavoidable occurrence of air-bubbles and diffraction-phenomena, all of which can be avoided only by preparing an absolutely perfect slide (and we mean absolutely in the absolute sense)—any such worker, we say, will realize that stereo-photomicrography is, from the practical aspect, only a glittering dream, unless the worker can steel himself against mourning over the very obtrusive defects of an otherwise beautiful slide, or can deliberately degrade his standards of photographic work to an acceptance of what can hardly be considered as other than inferior work. One can, of course, simply ignore these defects; but they are so persistently obtrusive!

Cellulose; Its Behavior Toward Bisulphite or Sulphurous Acid Solutions

T. Nakashima, S. Ohora, and J. Murakami—J. Soc. Chem. Ind. (Japan), Suppl. 33, 199B (1930).—A short abstract of presumably a longer article in the Japanese edition of the Journal. It deals with the decomposition of sulphite liquor by heat, and possible reactions exerted upon cellulose under such conditions.

All experiments were carried out at 110° C. Heating for 24 hours with 5% by wt./vol. of SO_2 caused no deposition of sulphur, and the iodine number, as well as the acidity, remained unchanged. A very little sulphuric acid was formed, owing, doubtless, to the air necessarily included in the sealed tubes employed. Hydrolysis of cellulose, followed up with Fehling's solution, was decreased over the normal amount only slightly, while disassociation, followed up by viscosity measurements of the cupro-oxide-ammonia solution, was rather pronounced. Cellulose heated in bisulphite solution displayed a lower viscosity developing during the course of the heating, but increase in the copper number, and in the amount of beta and of gamma cellulose, was not great. Cellulose so treated in sulphurous acid solution showed a very great loss in viscosity, and the beta and gamma cellulose increased in quantity, while the increase of the copper number was not relatively great, nor was much sugar formed in the liquor.

A page of numerical results is added.

Linseed Oil Finishes Upon Viscose Silk

Dr. K. Goetze—Seide 35,445 (1930).—The process for the employment of linseed oil as a finishing agent for fibers of any kind appears to have been first brought to notice by German Patent No. 198,931 (author, J. Boyeux). It consisted in treatment of the fiber (natural silk) with a solution of the oil in an organic solvent. The process at first attracted little attention, in Germany, at least, and dyers were naturally opposed to its use, since upon long storage or keeping the oil coating became so far oxidized that it could be removed from the material to be dyed only with great difficulty, or sometimes could not be completely removed at all. However, the increasing use of artificial silks resulted in an increased degree of employment of the finishing method in question, since it was found that a more loosely twisted yarn could be used in weaving, and so a fuller weave be produced. The process began to be employed on the large scale, at first according to the patent (benzine, benzene, etc., being used as solvents) and also in a modified form, the oil being used in the form of an emulsion instead of in solution.

Linseed oil being a drying oil, and its action as a finishing agent depending upon its forming, through oxidation, a smooth, tough coating upon the fiber, and, further, the oxidation requiring to be effective rather rapidly—oxygen-carriers, catalysts, must be added to the finishing material in order to secure a hastening of the oxidation-process. But such additions can be avoided, if the treated yarns be exposed to ozonized air, a method which is in some cases being carried out practically.

As so often happens in the case of technical procedures, the method possesses both advantages and disadvantages. The hardening of the oil-layer can cause damage to the fiber, as becomes particularly evident when the finished yarn has been wound upon spools. The character of the oil may so alter during oxidation, that it cannot be entirely removed before dyeing, in which case streaky effects are obtained. Sometimes a decided increase in weight takes place, which may be undesirable. Again, when the treated material is worked up for artificial silk effect-threads in woolen goods, it will be found, sometimes, to have acquired an affinity for acid wool-dyestuffs, so that the effect-threads do not remain white, as they should.

D'Ans (Z. angew. Chem. 41,1193 [1928]) has studied carefully the course of the oxidation of linseed oil. In the case of atmospheric oxygen, and this is all which is involved here, the reaction proceeds in two parallel directions, one an oxidation which rapidly comes to an end, and the other always proceeding beyond this point. The first reaction, which consists essentially in the addition of oxygen to the double bond, leads to coagulation and film formation, this latter being in the present case just what is desired. When catalyzers or ozonized air are employed, the reaction is complete in 24 hours. The second element of the compound reaction is of a more deeply seated nature, and leads to chemical degradation of the oil, in ways which may prove dangerous to the cellulose. These two reactions are not strictly limited within certain definite bounds, but overlap more or less. The course of the first reaction is simple and safe enough. But there is a probability of unstable substances of a peroxide type forming, which could of course lead to the formation of oxycellulose. In the second reaction, certain acids are formed, which may quite possibly cause damage to the cellulose; for example, propionic, azelaic, caproic, caprylic, pelargonic, and formic acids; and, in addition, carbon dioxide and monoxide, water, and formaldehyde, which latter substance is of course none too desirable in contact with cellulose.

The average amount of linseed oil taken on by the fiber is about 3.4—4.5%. If it is applied by the solvent method, it penetrates through and through the fiber uniformly; by the emulsion-method, the surface and only a little of the substance within is impregnated. The metallic catalysts employed are manganese, lead (singly or both together), and copper compounds. Manganese compounds are not so much used at present, lead compounds being apparently more favored. The quantities employed are very small, e. g., for the metallic content, 0.003% of lead, 0.019% of lead, 0.0009% of manganese, or numbers of that magnitude, are specimen values. The author does not say that the presence of both manganese and lead compounds together is especially harmful, yet, in the one case where both were present, the fiber was the most damaged one examined by him. A curious, but not surprising phenomenon comes to light when a viscose finished with the oil containing a lead catalyst is worked up with woolen fibers into a compound weave. When such material is subjected to an alkaline boiling-off, the wool (presumably the fibers of it which are in proximity to the viscose fibers) become colored strongly yellow, and this color does not yield to bleaching. It is due to the splitting off of sulphur from the wool-substance through the hot alkali, and the formation of lead sulphide with the lead compounds in the viscose finish—implying some migration from viscose to wool, unless the boiling-off is of such nature that the oil-finish is dissolved off, and so can react with the nascent sulphur, while the latter is still semi-attached to the wool-substance. If the goods are to be dyed, this yellowing can often be masked in the dyeing, but this is not possible if the wool-element is to remain white.

Determinations of tensile strength and elasticity were carried out upon four samples of viscose, treated by the solvent and by the emulsification-method. In each case, the finished material suffered in tensile strength, slightly in most cases, but sometimes rather seriously. The elasticity figures were very variable, some showing slight and some heavy loss or gain. Between the two methods of application of the oil, there is not much choice.

The article closes with a discussion of the values given in two tables, as to the loss in tensile strength and elasticity suffered (a) by different grades of viscose variously finished by the solvent and by the emulsification-

methods, and then definished after storage for 3 months, and (b) by the same materials artificially aged and then definished. There is, as would be expected, a loss in all values in each case. Some losses are quite serious. "Unfortunately," the author says in closing, "these experiments have not unmistakably shown what is to be held responsible for damage to the fiber after it has undergone a linseed oil finish. The ash content has no bearing upon the question, no influence upon the finish-coating, for de-ashed silks all show less stability on storage than do the normal goods. Copper and iron compounds, and acids, in combination with linseed oil finishes, do have a harmful effect upon the fiber. The detection of the presence of these metals or acids give no information, however, as to their origin. It seems much more reasonable to suppose that these substances get into the fiber through the finishing process, rather than that they originate in the process of manufacture, where the viscose itself is produced, since in these establishments an even painful control is maintained over the process. At present, we can see no way of averting the tendering action of the linseed oil finish. It has frequently been recommended to add to the finish anti-oxidants, of which beta-naphthol is especially recommended. We have carried out experiments along this line, but unfortunately with only negative results. The addition of beta-naphthol had no influence at all upon the progress of oxidation, quite contrary to the case with other oils, with which the beta-naphthol entirely arrested the oxidation.

"Though these experiments have unhappily afforded no entirely clear view into the situation, yet it may be hoped that they have shown how important is a thorough working up of the subject."

Mutual Reaction Between Fiber and Dyestuff in Substantive Dyeing

Dr. W. Weltzien and Dr. K. Schulze—Seide 35,451 (1930).—The close of this portion of the series (earlier portions previously appearing in the above Journal). A complex, long paper, including two pages of (16) graphs and several tables. It is difficult to give any adequate summary of the contents. The gist of it consists in the establishment of the degree of absorption of the dyestuff by the fiber at various salt-concentrations, in connection with the problem of uneven dyeing.

Substantive Poly-azo Dyestuffs

German Patent No. 446,787 (*23/VI/'27*)—*Gesell. f. Chem. Ind. in Basel.*—The dyestuffs of this group are pyrazolone-ureas.

Two methods for their synthesis are outlined: (a) 1-aminoaryl-5-pyrazolone-3-carbonic acids are treated with phosgene in presence of suitable agents for neutralizing the HCl set free, and these ureas then coupled with two molecules of a diazotized amine, or with each one molecule of two different diazotized amines, under the conditions usual for multiple couplings for pyrazolones; (b) by producing, first, mono-azo couplings with the above simple pyrazolones and diazo-compounds (the same or different ones) and linking together two such mono-azo dyestuffs, the same or different, by treatment with phosgene in presence of neutralizing agents. The nature of the pyrazolone derivatives may involve saponification or reduction at some point in the synthesis, according to what is employed and what desired. Of the three examples given, two are orange dyestuffs very fast to light, and discharging pure white with hydrosulphite, and the third is a brown fast to light, and also discharging pure white.

Developer Dyestuffs (Pyrazolone-Azo Dyestuffs)

German Patent No. 450,747 (*22/IX/'27*) (*addition to G. P. No.* 447,625 *of 29/III/'25*)—*Chem. Fabr. vorm. Sandoz.*—Instead of the fundamental substance of the basic patent, 2'-methyl-3'-amino-5'-sulpho-1-phenyl-5-pyrazolone, the present addition proposes the three following modifications:

1—the tetrazo derivative of a symmetrical p-diamine is coupled with 3'-amino-4'-methyl-5'-sulpho-1-phenyl-5-pyrazolone-3-carbonic acid, or with 3'-amino-4'-methyl-5'-sulpho-1-phenyl-3-methyl-5-pyrazolone, to form symmetrical disazo dyestuffs.

2—a mono-azo coupling is produced between one molecule of the tetrazo-derivative of a p-diamine and one of an alphyl-hydroxy-carbonic acid, and this product, through the other diazo group of the diamine, coupled with a molecule of 3'-amino-4'-methyl-5'-sulpho-1-phenyl-5-pyrazolone-3-carbonic acid, or a molecule of 3'-amino-4'-methyl-5'-sulpho-1-phenyl-5-pyrazolone.

3—a mono-azo coupling such as under 2 is combined similarly with any other suitable second component to form a diazo compound.

The new products are claimed to be faster to light and of greater affinity toward unmordanted cotton than other similar dyestuffs. The three examples given are a dark heliotrope, a bright orange, and a red-brown. The latter gives a dark chestnut brown, very fast to washing, and discharging pure white, when diazotized upon the fiber and developed with beta-naphthol.

Insoluble Azo Dyestuffs

German Patent No. 409,564 (*3/V/'27*)—*I. G. Farben-Ind. A.-G.*—These products are diazo dyestuffs at least when finally generated. The first step in their synthesis consists in "covering" appropriate amino compounds by converting them in the usual way into N-sulphaminic acids; to the nucleus is then linked an unsulphonated amine by diazotization and coupling. The mono-azo dyestuffs thus formed are water-soluble compounds, which can be applied as such to suitable textile materials, the sulpho group of the sulphaminic acid group being then easily hydrolyzed off, reforming the original amino group. This dyeing, on the fiber, can then be diazotized and developed with any final second component desired, as beta-naphthol, Naphthol AS, etc., pyrazolones, etc.

Reciprocal Relations Between Fiber and Dyestuff in Substantive Dyeing

Dr. W. Weltzien—*Monats. f. Text. Ind.* 45,363 (1930). —An abstract of a lecture delivered before the Society of German Chemists at Frankfurt a.M., at this year's general meeting (Dye- and Textile-Chemical Section).

Work upon this subject for years past has made it possible to recognize certain relations existing between certain conditions, as, for example, between the fastness to rubbing and the size of particle of the dyestuff present in the goods; but it cannot be claimed that complete parallels between one point and another have been established in any case whatever. In reference, in particular, to the degree of dispersion, it must even be admitted that, according to work done up to the present time, dyestuffs with different dyeing properties may show the same degree of dispersion. A very fine, perhaps the finest, criterion in deciding upon the dyeing properties of the substantive dyestuffs is afforded by the phenomena of uneven dyeing upon artificial silk. The very minute differences coming into evidence in this field of work can be varied at will, and ways have been devised to take advantage, through alteration of conditions, of this variability in the variability of the dyestuff, so to speak, so that the problem of undesired variation of levelness in practical work can be overcome. It has already been found that by swelling of the artificial silk fibers in question, in 4% caustic liquor, a decided improvement in levelling properties comes about; and this fact has helped in the establishment of a practical method of dyeing.

Experiment has shown that only a study of the dyeing process itself as a whole, and not merely of the dyestuff solution alone, leads to the desired end. We have to measure the quantity of dyestuff taken up under different conditions, during the dyeing, and then to determine the interdependence of certain factors. We have to consider principally (1) temperature, (2) concentration of salt, (3) time (rate of absorption). Other determinations which are at present being made, as H-ion concentration, iso-electric point, etc., can come into consideration only after these three points are cleared up.

In regard to the first point, earlier experiments have shown that the yellow and red dyestuffs, which dye level, go on with maximum ease even at 50°-70° C. as an average, while the non-levelling ones, the blues, go on well only at 80°-100° C. As to point 2, we obtain extremely interesting results if we study the relation of the amount of dyestuff taken up after ½ hour, to increase in the amount of salt present. Naturally, as the concentration of the salt increases, the amount of dyestuff taken up also increases, and the dyeing becomes deeper, as has been known since the earliest days of dyeing. But, in this relation, it is of the highest importance that naturally the greater changes in the appearance of the dyed fiber occur during the taking up of the first portions of the dyestuff, and, of course, at the lower salt-concentration, while, as greater amounts of dyestuff are taken up, of course with the addition of greater amounts of salt, the eye can perceive only slight differences between the various stages of increasing depth of tone. The colorimetric method of determination makes it possible to recognize distinct differences in the depth of the dyeing, even in case of the absorption of large amounts of dyestuff, it is able, therefore, to afford a more comprehensive understanding, than is otherwise possible, of the absorption-process in the dyeing of the fiber.

If, as mentioned, we study the relation of amount of dyestuff absorbed to the amount of salt present, under known conditions, the results can be expressed in characteristic curves, or graphs; we can determine from these graphs that the dyestuff which takes fairly well upon the fiber with little or no addition of salt belongs to the group of level-dyeing colors, while in particular the unevenly-dyeing blues possess an entirely different characteristic graph, for they almost do not dye at all without the addition of salt, and then, within certain limits, go upon the fiber in a measure proportional to the amount of salt used. If, on the other hand, we study different fibers in reference to one and the self-same dyestuff, for example, Brilliant Benzo Blue 6B, which reacts with extraordinary delicacy toward the more minute differences existent in the different fibers, then we can plot characteristic curves for different artificial silks, e.g., even for different kinds of viscose; and these graphs display wide differences between each other; they establish the tinctorial distinctions between the different materials in an interesting way. By this method of working, we can e.g., also clearly recognize the influence of certain kinds of pretreatment of the fiber by the form of the graphs.

A quantitative method is thus afforded, which promises to give us a deeper insight into the nature of the process of substantive dyeing, than the so much used qualitative method of estimation of the usual comparative dyeing. Of especial interest is the comparison of the curves for bleached cotton, cupro silk, and viscose silk, which shift reciprocally; i.e., without addition of salt, dyeing in separate baths shows the order of affinity between fiber and dyestuff to be (in descending series) cotton, cupro silk, and viscose silk. When salt is added to the bath, as the concentration of the salt rises, the sequence of affinity alters; at the highest concentration of salt, the viscose silk is most strongly dyed, the cupro silk next, and the cotton least.

As to the third point (see above); there are not available at present sufficient quantitative measurements of the rate of absorption of dyestuff by the fiber to help us very greatly in forming any ideas in this relation. The author is still working upon this topic. It is a valuable point to note that, in the case of comparative dyeings of different fibers, the one which has the higher rate of absorption, dyeing rapidly, in so dyeing alters—lowers—the percentage of dyestuff in the bath, which introduces a variable into the problem, the fiber with lower absorptivity being doubly at disadvantage. It is not yet possible to consider cases of mixed weaves, therefore, since as yet we are only finding our way into the simpler problems of simple cases.

Turkey-Red Oil and Tensile Strength

Dr. F.-Deutsch. Faerber-Ztg. 67, 23 (1931).—Among practical workers one sometimes meets with the view that the use of Turkey-red oil and similar products upon vegetable fibers is, in the strictest sense, not entirely without danger, since these substances produce after some time a tendering of the fiber, and are therefore not to be considered for use with specially sensitive goods, especially artificial silks. As a support for this assumption, it is supposed that the Turkey-red oil splits off sulphuric acid, which would of course tender the fiber. There has recently been published (in the above Journal) a warning against the use of Turkey-red oil for the finishing of artificial silk Crepe-de-Chine, for which no reason is given, but which is evidently based upon some such idea as the above.

As to the actual facts, we know that Turkey-red oils are produced by treatment of castor oil with concentrated sulphuric acid. The sulphuric acid is taken up into the molecule to form an ester, all but a very small amount. Through subsequent treatment with caustic soda, the sulphonated oil is almost neutralized; that is no trace of free acidity, so to speak, is allowed to remain. This acidity is not due to sulphuric acid, but to free carboxyl groups present in the fatty acids. Since the inorganic sulphuric acid residue is much stronger in comparison to the carboxyl group, and so possesses greater salt-forming power, the partial neutralization referred to is complete as to the sulphuric acid component, and incomplete as to the carboxyl. Thus, the acid reaction of the oil depends upon carboxyl, rather than upon sulphuric acid. These carboxyl groups, however, in reference to the cellulose of vegetable fibers, are decidedly not dangerous. For vegetable oil as olive and peanut oils, contain a certain amount of free fatty acids (carboxyls, therefore), and yet are known to be absolutely harmless to the fibers.

Sulphuric acid itself is present in the Turkey-red oil to such a slight extent that there is no ground for suspecting its having any influence upon the vegetable fiber. Certainly, there are degrees in the extent of sulphonation, i.e., in the percentage of sulphuric acid residue (in the chemical sense) in different products, a fact which is evident when one considers the "highly sulphonated" products of recent years. In contrast to such products as these, the common Turkey-red oils contain only about 16 to 12% of sulphuric acid in the molecule. It should be noted here that the higher sulphonated oils find use preferably for animal fibers, while the lower-sulphonated, the common, oils, are used chiefly for cotton and artificial silk. That is, just those oils which contain the minimum of sulphuric acid, and so preserve best the character and valuable properties of the vegetable oils, are the ones used for the finishing of artificial silk. They characteristically give no clear solution in water, but emulsions, a proof that they still, after sulphonation, stand near in character to the original vegetable oil.

For certain definite purposes the more highly sulphonated oils are recommended for cotton; for example, as softening agents for weighting-finishes. As a result of their high stability toward salts, which far surpasses that of the lower-sulphonated oils, only these highly sulphonated oils can be used as the salt concentration increases. But even on purely theoretical grounds, if one assumes that in such a case a splitting off of sulphuric acid could take place, yet further consideration will show that a weakening of the fiber cannot take place. Since a neutralized carboxyl group, therefore a "soap-group", is present, any free sulphuric acid would be neutralized by the alkali of this soap-group, on the basis of the more powerful tendency of the sulphuric acid toward salt-formation. Therefore, not free sulphuric acid, but free carboxyl, that is essentially, free fatty acid, would be present as the end-result; and, as hinted above, the mixture would approximate toward the behavior of natural vegetable oils containing free fatty acid. These theoretical considerations have been subjected to experiment, in order to decide actually by trial whether highly sulphonated oils can cause damage to vegetable fibers on standing in contact with them.

Cotton yarn, twisted and untwisted, was treated with finishing-mixtures which contained 200 g. of magnesium sulphate and 60 g. of dextrine per liter, and a parallel experiment carried out with a bath containing 15 g. per liter of one of the commercial highly sulphonated oils. With these materials, a large series of tests was made to determine the average tensile strength. The first determinations were carried out 2 weeks after finishing, the second set after 10 weeks, in order to observe whether damage was progressing during storage. The results were as follows:

Material	Untwisted		Twisted	
	2 Weeks	10 Weeks	2 Weeks	10 Weeks
Untreated	300	...	792	...
Treated without oil	372	397	926	870
Treated with oil	406	415	962	965

(figures are in grams at 60 cm. length sections).

These figures show that, even with several weeks of storage, no tendering of the fiber sets in case of the oil finish. We can, on the other hand, affirm that through the filling of the fiber a firmer union between the micelles is brought about, which is most evident with goods containing the oil. It is evident, too, that in the case of the lower-sulphonated oils, which contain much less sulphuric acid, the danger of damage to the fiber is correspondingly less. From every viewpoint, theory and practical tests agree that tendering of cotton or artificial silk through the sulphonated oils is not to be feared, and that such products, provided that they are of reputable quality, are suitable for use upon such material.

Diastase in the Textile Industry

A. Boidin—I. Progr. n. Ind. Tint. è Tess. 29,216 (1930).—A five-page paper presented before the VIth Congress of Chemical Industry in Paris a short time ago. Of general nature.

Vat Dyestuff of Anthraquinone Series

German Patent No. 436,077 (23/X/'26) (*addition to G. P. No.* 426,710 *of* 13/X/'22)—*I.G. Farben-Ind. A.G.*—The original patent covered the heating of 1-5-diaroylnaphthalene with anhydrous aluminum chloride at a high temperature, to form certain condensation products. This new claim extends the above to the use of 3-9-diaroylperylenes. The dibenzoyl-perylene of Scholl, Seer, and Weizenboeck Ber. 43, S. 2208 (1910) could not be condensed by these authors through heating with aluminum chloride, but the present method does cause it to condense (long heating, high temperature); and, in fact, to isodibenzathrone, well known as a valuable violet vat dyestuff.

Dyeing of Wool-Silk Unions

German Patent No. 443,283 (21/IV/'27)—*I.G. Farben-Ind. A.G.*—Pyrazolone dyestuffs which contain carboxylic acid ester groups, one or more, in either the first or second component, possess a greater affinity for silk than do other pyrazolone colors. By proper choice of dyestuffs, therefore, it is possible to dye wool-silk mixtures from a single bath in the same depth of tone. Four examples give suitable combinations.

Synthesis of Artificial Silk—Mixed Acetate and Cyanacetate

G. R. Levi—I. Progr. n. Ind. Tint. e Tess. 29,212 (1930)—A short paper without details—an extended note—regarding a new textile ester, containing, as the title indicates, the acid radical of both acetic and cyanacetic acids, the product being comparatively rich in nitrogen, and so apparently rather tending to the cyanacetic side. The product behaves much as the ordinary acetate, as to solubility, capability of being spun, etc. It possesses a greater affinity for all dyestuffs than does the ordinary acetate. The CN group can easily be hydrolized, at 40°-50° C., into the $CONH_2$ group, which opens up new possibilities for research, and quite possibly practical results of value.

Simultaneous Dyeing of Cotton with Ice-Colors and Vat Dyestuffs

German Patent No. 442,034 (19/III/'27)—*I. G. Farben-Ind. A.-G.*—The goods are padded with a suitable second component for azo-dyestuffs, and a reduced vat dyestuff, in a mixed, alkaline bath, and the color then developed in a bath of a diazotized base for the first component. The two processes, of coupling of the azo dyestuff and axidation for the vat dyestuff, take place simultaneously. It is claimed that the padding with the second component is much more stable toward air in the presence of the vatted dyestuff (naturally, since there would be hydrosulphite present).

The results are claimed to be faster to washing, rubbing, and boiling, than is the case with the vat dyestuffs alone, and the dyeings are very level.

Vat Dyestuffs of the Anthraquinone Series

German Patent No. 454,425 (6/I/'28)—*I.G. Farben-Ind. A.G.*—The original material, 2-brom-1-9-pyrazolanthrone (for the preparation of which directions are given), or homologues or substitution products of it, is condensed by heating in a suitable medium with a catalyst, as copper, or copper salts. In the example, 3 parts of the bromine derivative, 1.5 of anhydrous potassium acetate, and 0.1 of copper acetate are heated in 20 volumes of nitrobenzene at the boiling-point of the mixture, for several hours, with steady stirring. When the reaction is over (when none of the original bromine derivative used can be detected in the mixture) the mixture is allowed to cool, the product which crystallizes out is filtered off, boiled out with alcohol, and, if necessary, treated with dilute NaOH to remove any possible present bromine derivative.—The product is a red-brown powder, crystallizes from hot nitrobenzene (difficultly soluble) in fine needles, dissolves in concentrated sulphuric acid with a deep pure blue color, and vats as usual.

Azo Derivatives of the Anthracene Series

German Patent No. 461,500 (20/VI/'28)—*I.G. Farben-Ind. A.G.*—The fundamental substances, amino- or hydroxy-anthraquinones, are substituted with protective groups (e.g., acetylated etc.), and reduced to the leuco-derivatives as usual. These leuco-compounds are then reacted, in the presence of media such as tertiary bases, with halogen-sulphonic acids or their esters, as, e.g., chlor-sulphonic acid, etc. During this reaction, the protective groups are split off, and the products are, as salts, easily soluble in water, and reasonably stable. Owing to the modification (or, perhaps, better, the temporary annulment) of the carbonyls of the anthraquinone ring, these new products will undergo coupling with diazo-compounds, which is not possible when the free carbonyls are present.

The products, as azo compounds, are either valuable dyestuffs, or may be used for conversion into other dyestuffs, particularly of the anthraquinone series.

Vat Dyestuffs, Anthraquinone Series

German Patent No. 448,984 (1/VI/27) (*addition to G.P. No.* 390,201 *of* 7/V/'22)—*Gesell. f. Chem. Ind. in Basel.*—The original patent deals with the condensation product formed between amidated anthraquinone derivatives, whose amino groups may also be substituted, and derivatives of 1-3-5-triazines, halogenated in the nucleus. The products may at the same time (i.e., in the same reaction mixture) be further condensed with other suitable substances. This new patent increases the scope of the reaction to 5- or 8- amino-2-1-anthraquinone-acridones or 4-amino-4'-halogeno-2-1-anthraquinone-thioxanthones or -anthraquinone-acridones. The seven examples given illustrate the production of new products which dye vegetable fibers from red-violet to green, blue, or gray, from the hydrosulphite vat. The dyeings are of excellent fastness to chlorine, light, and kierboiling under pressure.

Coat and Dress Colors for Fall

The final selection of basic coat and dress colors for the coming Fall has been made by the Color Coordination Committee of the National Retail Dry Goods Association, after several meetings with the Textile Color Card Association and members of its official committees representing leading manufacturing groups, it was recently announced by A. G. Jarvis, chairman of the retailers' committee.

The colors chosen fall into three groups, namely, basic colors for coats, coordinating silk shades for dresses, and a selection of lighter or more animated shades especially adaptable to wool dresses and sportswear.

The basic coat colors are Afrique, Biskra Brown, Kiltie Green, Malaga Red and Bleu Marine.

The silk dress shades coordinating with the above are: Annamese Brown, Kiltie Green, Cassis and Admiralty. An additional silk dress shade in the rust family is Algérie.

The wool dress colors are La Playa, Algérie, Ambertone, Tropic Green, Colonial Red and Yankee Blue.

All of the above colors are selected from the 1931 Fall Season Silk and Woolen Cards issued by the Textile Color Card Association.

It was explained by Mr. Jarvis that the selection of the basic ensemble shades for dresses and coats was arrived at after several joint sessions with the Textile Color Card Association, and representatives from all the important apparel and accessory industries.

These colors will be identified by their official Textile Color Card Association names in the textile and cutting-up trades, and buyers of the National Retail Dry Goods Association member stores will be requested to use these names when asking for the basic coat and dress colors in the market.

These ensemble shades which retailers will use as a basis for store-wide co-ordination will likewise give the manufacturers an advance indication of the colors to which their production should be keyed.

Wide promotion will be given these colors by the National Retail Dry Goods Association, as well as by the manufacturing groups which have co-operated in their selection.

New Indigosol Blue

Carbic Color and Chemical Company recently issued pamphlets describing a new Indigosol Blue for wool dyeing. The new dyestuff is a water-soluble leuco compound of the Indanthrene type and is said to be characterized by outstanding fastness properties and bright shades in both day and artificial light. It may be used in combination with any of the other Indigosols.

Du Pont chemists have discovered that Duco Household Cement stops runs in stockings. Tests conducted by them show that, since the cement is waterproof, the garment can be washed many times.

General Dyestuff Releases

The General Dyestuff Corp. recently sent out circulars on the following new dyestuffs:

Fast Corinth Salt V Conc.—combination with Naphthol AS yields reddish brown shades believed to have very good fastness.

Supranol Brilliant Red G—homogeneous dyestuff of very bright shades and considered of good fastness.

Indanthrene Navy Blue B R F Powder Fine—for dyeing and printing—claimed to have good fastness to washing, light, chlorine, and boiling soda.

Acid Chrome Blue R R A—recommended for dyeing wool afterchromed, or chrome bottomed and claimed to leave silk unstained.

Patent Blue A Extra Conc.—acid color on wool of a bright greenish shade said to have good fastness to washing and light.

Benzo Sky Blue A Extra Conc.—recommended for union dyeing and is claimed to have good fastness to acid and alkali.

Chrome Fast Yellow R D A Powder—recommended for cotton printing and believed to be particularly valuable on account of its fastness properties.

Indigosol Blue A G G—produces bright greenish blue on wool which is said to have excellent fastness to light.

Celliton Fast Brown 3 R Powder—a new acetate silk dyestuff of reddish shade. Good fastness and leveling properties are claimed for it.

Indigosol Printing Blue I G G and Indigosol Printing Blue I B—claimed to produce bright blue shades of good fastness to light, soaping, and chlorine.

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WANTED

An experienced practical Dyer who can successfully make exact matches of shades in raw stock skein dyeing by hand and on Hussong Dyeing Machines and on Package Dyeing Machines, in all types of colors, such as Direct, Vat, Sulphur and Developed Colors. No one without successful practical experience need apply. In application state actual experience and give references from previous employers and state salary at which you are willing to begin work. Position open at once for right man. Bibb Manufacturing Company, Macon, Georgia.

POSITION WANTED

DYER—Six years' experience at bleaching and dyeing wool, cotton, jute and union raw stocks and yarns. Thoroughly experienced in all stages of carpet manufacture. Age, 26; married. Address: Classified Box No. 676, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.